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THE

INDIAN FORESTER.

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NOTES ON SOME TREES AND SHRUBS OBSERVED DURING A RECENT BOTANICAL EXPEDITION TO NORTH-EASTERN KUMAUN.

THE vegetation of this portion of Kumaun not having been previously explored, I venture to hope that a few notes on some of the trees and shrubs noticed during the expedition I made last August and September will be of interest to some of the readers of the "Indian Forester."

Without entering into unnecessary details, I will first of all give a short account of the route there and back. Starting from Naini Tál on the 9th of August, I proceeded *viâ* Almora to Bageswar on the Sarju river, and thence by Kapkot, Sáma, and Gíni, to Munshiári in the Gori Valley. Here we halted for a couple of days in order to divide our baggage, despatching what we did not immediately want into Dárma by the Chipla route, intending ourselves if possible to cross by a higher pass from the Rálam Valley. From Munshiári we went up the Gori Valley to Páton, and thence to Rálam *viâ* Sába, collecting at the latter place several specimens of a most interesting little plant placed by Mr. Bentham in the natural order *Chloranthaceæ*. It was first found in this locality many years ago by General R. Strachey who with Mr. Winterbottom made valuable and very extensive collections of Kumaun plants. All the specimens of this particular plant were, however, unfortunately lost before it could be satisfactorily placed in any known natural order. Its re-discovery was, therefore, an important object, and one which chiefly determined us to select this particular route.

At Rálam we had to remain three days waiting for coolies from Milam to take our loads across the Rálam Pass. The time was not by any means wasted, for the Rálam Valley has a very rich flora, and many rare species were collected. It took us three days getting over the pass into Dárma, the second night being spent on a glacier at an elevation of over 17,000 feet above the sea.

We halted for a couple of days at Shibu, one of the principal villages in Dárma, and from there we made for the Dhauli Valley and across the Lebung Pass into Byáns. After remaining a couple of days at Kutti, the highest village in the Byáns Valley, we made our way down to Kangua or Káwa, a village on the Nepal side of the Káli, which river comes in here from the direction of the Lipu Pass. From here we followed the course of the Káli Valley all the way to Askot, returning to Almora *viâ* Bininág.

By this route a good idea may be obtained of the rainy season vegetation of this section of the Himálayas, both tropical, temperate and alpine, the altitudes ranging between about 2,500 feet to over 18,000 feet above the sea. As only two months were spent over this journey, it was not possible to make anything like a complete exploration of the districts through which we passed, and many interesting plants must have escaped our notice altogether. The following notes, however, are offered as a small contribution to our knowledge of the trees and shrubs of North-East Kumaun.

Schyzandra grandiflora, H. F. & T.—Forests near Sosa, where it is called *sirkul*.

Berberis umbellata, Wall.—Near Kangua on the Nepal side of the Káli Valley. A much more graceful plant than any of the varieties of *B. vulgaris*, which at first sight it resembles. The branches are more slender, the leaves less spiny, and the flowers are *subumbellate* on very long peduncles.

Myricaria germanica, Desv.—Rálam Valley near the glacier, 11-12,000 feet. Common also in Dárma and Byáns in the beds of streams.

Saurauja nepalensis, DC.—Tolerably abundant in East Kumaun at low elevations. Its time of flowering appears to vary a good deal; in the Forest Flora (page 25) it is said to be in flower about May; according to Strachey November is the time; in the Rámganga Valley I found it flowering in September.

Æsculus indica, Colebr.—Called *kishiní* in Byáns.

Acer cæsium, Wall.—Called *kainshing* in Byáns.

A. villosum, Wall.—The Byáns name for this species is *tikainshing*.

Spondias mangifera, Pers.—Káli Valley near Cháchhum 2-3,000 feet.

Piptanthus nepalensis, D. Don.—Forests near Sosa, where it is called *biza*.

Caragana pygmæa, DC.—Abundant in Dárma and Byáns, forming in fact a large proportion of the vegetation in the drier alpine regions.

C. crassicaulis, Benth.—Plentiful in similar localities, but extending into less arid tracts.

Desmodium laburnifolium, DC.—Sarju Valley, 3-4,000 feet,

growing amongst boulders near the river. A local plant and not known west of Dehra Dún, where I found it two years ago in an exactly similar locality.

D. tiliæfolium, G. Don, var.—Leaves coriaceous, densely white tomentose beneath, leaflets broader and less acuminate than in the type. Abundant in the Káli Valley between Garbyáng and Budhi, 9-10,000 feet.

Dalbergia hircina, Ham.—Not uncommon by river sides at low elevations. The name *bakalpattia* was given to me for this tree besides that of *tantia*.

Prunus Padus, Linn.—Called *bombaksing* or *bombáli* in Byáns.

P. nepalensis, Ser.—Forest above Munshiári in the Gori Valley, where it is called *bang bhálu*.

Prinsepia utilis, Royle.—Known in Byáns under the name of *dentili*.

Spiræa sorbifolia, Linn.—Called *lusim* in the Kutti Yangti Valley.

Rubus alpestris, Blume.—Rather a tall straggling shrub with nearly glabrous foliage and large red fruit. In the hemlock spruce forest near Sosa, 9-10,000 feet. This is the only locality where I noticed the plant.

R. nutans, Wall.—A prostrate-growing bramble with large handsome white flowers and bright red fruit. Not uncommon in the forest region between 8 and 10,000 feet.

Rosa sericea, Lindl.—Abundant, especially in the drier parts of Dárma and Byáns. Called *chapalu* in Byáns; the same name is given to *R. macrophylla*.

Pyrus baccata, Linn.—(The Siberian Crab).—Called *rutripuli* in Byáns, where the fruit is eaten. Several trees were observed in the *chil* forests near Kangua on the Nepal side of the Káli river; elevation about 11,000 feet.

P. vestita, Wall.—The Byáns name for this tree is *naibel*.

P. Aucuparia, Gærtn.—In the birch forests near Shibu and in the Dhauli Valley. The berries are bright scarlet.

P. foliolosa, Wall.—Common in the birch forests. Called *martili* in Byáns.

Cotoneaster bacillaris, Wall.—Called *tiching* in Dárma, and *changma* in Byáns.

Hydrangea aspera, Don.—Near Sáma, 5-6,000 feet.

H. vestita, Wall.—Forest above Sosa, 10-11,000 feet.

Ribes Grossularia, Linn.—The wild gooseberry grows very luxuriantly in the drier parts of Dárma and Byáns. It is called *sirkuchi* or *baikunti* by the natives of these parts.

Viburnum cotinifolium, Don.—The Byáns name for this is *perálu*.

Lonicera rupicola, H. F. & T.—Plentiful in Byáns, forming near Kutti magnificent hedges between the cultivated fields.

L. spinosa, Jacquem.—In the drier parts of Byáns this species

is very common; so also are *L. myrtillus*, *L. obovata*, and *L. purpurascens* in damper localities in the forest region.

Pieris ovalifolia, *Don.*—Called *gáshing* in Byáns.

Rhododendron arboreum, *Sm.*—The Byáns name is *tofshing*.

Bassia butyracea, *Roxb.*—There are some fine specimens of this tree close to the village of Ganai near the Sarju Valley. The vegetable butter (*phulwa*) extracted from the seeds is a capital remedy for chapped hands and face, a complaint one is always liable to at high elevations.

Syringa Emodi, *Wall.*—The Byáns name for this is *tworsing*.

Solanum verbascifolium, *Linn.*—Called *ásheva* in the Káli Valley.

Hippophæ salicifolia, *Don.*—Abundant in some of the valleys at an elevation of 8-10,000 feet, growing sometimes into moderate sized trees. The rough bark favours the growth of epiphytes, more especially ferns, and during the rainy season these trees often form remarkable objects of beauty. In Byáns the name *taruah chuk* was given to me for this plant.

H. rhamnoides, *Linn.*—Always at higher elevations than the preceding. Specimens were gathered in the Nipchang Valley on the Lebung Pass, and in the Kutti Yangti Valley in Byáns.

Arceuthobium sp.—A very curious little parasite belonging to the *Loranthaceæ*. It was found in considerable abundance on the branches of *Pinus excelsa* on the Nepal side of the Káli Valley between Kangua and Garbyáng at an elevation of 10-11,000 feet. This parasite at first sight appeared like bright green moss covering the smaller twigs of the pine trees which overhung the road. On examining it with a lens it was found to be mainly composed of minute flowers, male and female, the sexes being segregated on different parts of the branches. Mr. Brandis in the Forest Flora (p. 394) describes a species of *Arceuthobium* (*A. Oxycedri*, M. Bieb) discovered in Lahul as a parasite on *Juniperus excelsa*. The description there given determines the genus of the Nepalese plant, but I am inclined to think that it will prove to be a new species. The flowers are almost sessile, the female plants having a few more joints to the simple stems than those of the male, the flowers of which appear to be quite sessile. The perianth of the male flowers is 3-5-partite with valvate æstivation, the sessile anthers are attached near the centre of the perianth segments, and there is a small rudimentary ovary. The female flowers have a 2-partite perianth, supporting an ovoid ovary, very much resembling the sporange of a moss. The much reduced scale-like leaves are opposite, and with their edges combined at the base so as to form a sheath.

Loranthus ligustrinus, *Wall.*—Very common on *Machilus* and on several other trees between Askot and Almora.

Ficus trachycarpa, *Miq.*—Near Sáma at about 4,000 feet.

F. Cunia, *Buch.*—Called *kirmca* in East Kumaun.

Excœcaria acerifolia, F. Didrichs.—Abundant in the Sarju Valley near Kapkot. The Bhutias call the plant *básingh*, and use the leaves as a cure for rheumatism.

Jatropha Curcas, Linn.—A few plants were seen growing near a village in the Káli Valley at an elevation of 3,000 feet. The Nepalese name for this shrub is *shajun*. These plants, I was told, had been imported from Nepal.

Buxus sempervirens, Linn.—Called *shibsashin* in Byáns. I saw some fine specimens in the Káli Valley at an elevation of between 7 and 8,000 feet.

Quercus lanuginosa, Don.—Below Sosa at about 7,000 feet. Plentiful also between Askot and Dandihát from 4,500 to 5,500 feet.

Q. dilatata, Lindl.—Called *ramshing* in Byáns.

Q. annulata, Sm.—In the neighbourhood of the Rámganga and Sarju Valleys at an elevation of about 3,000 feet.

Castanopsis tribuloides, A. DC.—Between Askot and Karela in the Rámganga Valley growing with *Quercus lanuginosa* and *Q. incana*. The natives call it *katonj*.

Juglans regia, Linn.—This tree is called *kabsing* in Byáns.

Ephedra vulgaris, Rich.—Rálam, Nipchang, and Kutti Yangti Valleys from 11-15,000 feet.

Pinus excelsa, Wall.—Not a common tree in Kumaun ; it is plentiful however in the Káli and Kutti Yangti Valleys, forming small forests between the villages of Nábbi and Garbyáng. In addition to the names *raisalla* and *lanshing* it has another in Byáns, viz., *durrasalla*.

Abies dumosa, Loudon.—There are some beautiful forests in the neighbourhood of Sosa in North-East Kumaun, which are mainly composed of this fine tree. The elevation is from 9-10,000 feet. The native name is *tangshing*.

A. Webbiana, Lindl.—Not uncommon in the Kutti Yangti and Káli Valleys between 11-12,000 feet. Called *wúman* or *wúnbusing* in Byáns.

Cupressus torulosa, Don.—Plentiful in the forests above Gini, where it is called raisalla, one of the names given to *Pinus excelsa*.

Juniperus communis, Linn.—Common in the Kutti Yangti and Káli Valleys. The Byáns names for this species are *chache* and *pates*.

J. Wallichiana, H. F. & T.—Extremely abundant in the drier parts of Byáns, often attaining to the highest limits of vegetation. Native names are *bhil* (Hind.), *shirchin* (Byáns), and *poh* (Tibet). Both Bhutias and Tibetans use the branches of this plant in their religious ceremonies.

Chamærops Martiana, Wall.—A few specimens of this handsome palm were found in the forests above Gini. This palm, it appears, does not yield fruit annually, and no seeds were obtainable this year. It is called *tákhal* in East Kumaun.

Phœnix sylvestris, Roxb.—Common in the valleys at low elevations. Very abundant in a valley below Bininág associated with *chir* at an elevation of 3-4,000 feet. The interior portion of the young stems is eaten in times of scarcity. It is pure white with a firm brittle consistency, and having a flavour resembling that of the sweet chestnut. This palm is also known by the name *tákhal.*

Wallichia densiflora, Mart.—Plentiful in a damp ravine near Kinkola in the Káli Valley at an elevation of 2-3,000 feet: growing with the wild plantain, which latter has every appearance of being indigenous to the locality.

J. F. DUTHIE,

31st October, 1884. *Botanical Gardens, Saharanpur.*

SOUTH AFRICAN INDUSTRIAL EXHIBITION.

Cape Town, September, 1884.

THE specimens are surmounted by a rough Map of the Forests of Knysna, on which are stated the following information on the objects of Forestry, present conditions and forest prospects of the Colony:—

FOREST WORK AND MANAGEMENT.

Objects.—The forest regulations now in force have the following ends in view:—

1. To dispose annually of the quantity of timber which the forests can yield in perpetuity, so that each year the quantity felled may be replaced.
2. To assure the reproduction as quickly as possible of the best species on the parts cleared.
3. To open places for felling at distances as convenient as possible for wood-cutters who have formed locations within the forests.

Method adopted to attain the required end.—1. The forests are divided into blocks varying in extent from 200 to 800 morgen, according to the natural configuration of the country. Ravines, kloofs, ridges, &c., are taken advantage of to form boundaries.

2. Each block, or "series," of forest is divided into 20 sections.

3. These sections are opened successively, each for two years (all the others being closed), and then rest for a period of 38 years.

4. In each open section the matured, decaying, and surplus trees are marked for felling. They are numbered, measured, and registered, and are then available for purchase by the public on payment of license fees in advance.

Application of method :—Duties and work of officers for systematic management.—1. The work of each officer of the "higher grade" extends over a country of 5,000 to 15,000 morgen of forest land according to circumstances. The timber, or "high" forests, are surveyed by him. He determines the boundaries of series, and arranges the scheme of the formation of sections. Conservators issue such instructions in these operations as their long experience may dictate. These officers, after approval by the head of the department, open the lines, survey the sections, mark, count, and number the trees available for felling. They also survey the areas for re-planting, and direct all forest works requiring professional and scientific training.

2. A "forest guard" has charge of two or three series, and assists in survey operations, the opening of lines, and the marking of trees to be felled. He inspects all licenses, and sees that no unnecessary damage is caused in felling. He supervises his division, and carries out all forest work which his superior officer may direct in sowing, planting, the repair of roads, &c., &c.

Present condition.—The total forest area in the Knysna conservation is approximately 50,000 morgen. Of this about three-quarters has been more or less exhausted by reckless and indiscriminate felling. Despite this, 15 series have already been formed, in which 12 sections have been marked. The total number of timber trees marked for felling during 1884-85 is 20,000, containing 370,000 cubic feet (squared), and 25,000 poles and spars, the whole valued, at license rates, at £6,000.

Forest Prospects.—Future produce of the forests of Knysna.—These 50,000 morgen of forest land, even in their present condition, properly worked, will yield annually 1,200,000 cubic feet of timber, squared, valued at £15,000. The annual increment of forests, when properly managed, in other countries is, at the least, at the rate of 100 cubic feet per morgen. When the annual production of the forests of the Knysna reaches only 50 cubic feet their yield will be 2,500,000 cubic feet, value £30,000 per annum.

Organization and Staff necessary to ensure this production.—One conservator at Knysna, 3 officers of the higher grade, 24 forest guards, extra labour, and all various expenses. The cost of such an establishment would be £5,000 per annum. The conservation of Knysna is not yet completely organized. Those of King William's Town and Cape Town are still less advanced. In many districts of the colony, over which the Forest Department has not yet control, the best and most useful trees are being destroyed. The Transkei and Griqualand West may be instanced. If all forests of the colony were properly conserved, 10 conservators would be required, but the climate would be completely transformed, and a source of real wealth created.

The Exhibits comprise :—

1.—Specimens of Indigenous Woods.
2.—Bark, Charcoal, Wild Grapes, and Seeds used in Reforesting.
3.—Maps and Pamphlets.

For full particulars see following descriptions of similar specimens sent to the International Forestry Exhibition, Edinburgh.

Descriptive Catalogue of Specimens prepared by the Forest Department of the Cape Colony for the International Forestry Exhibition at Edinburgh, 1884.

The Colony of the Cape of Good Hope extends from 28 degrees to 34 degrees latitude south, and from 18 degrees to 28 degrees longitude east, exceeding these limits but very slightly. Its area contains approximately 205,100 square miles. The surface of the country generally is broken, rising step by step from the sea-board to the interior by a series of mountain chains running in a direction east and west, and parallel to the coast.

At the present day all the large forests are included between the mountain ranges near the sea and the coast itself. There are patches of forest dotted over the southern slopes of the Outeniqua and Amatola mountains. Altogether the total area of the forest is estimated at about 100,000 morgen, and in many of them trees of large dimensions are still found, while day by day the opening up of new roads renders their exploitation less difficult. In four charts are shown :—

1st. The rainfall for the year in the different zones.
2nd. The rainfall during the winter.
3rd. The rainfall during the summer.
4th. The mean number of days of rain registered annually at the different observatories.

According to these charts, based on the mean observations up to the present time, there is a remarkable coincidence between the presence of forests and the annual quantity of rainfall. Whatever conclusion is drawn from it, the fact remains that copious rains and luxuriant forests are inseparable. Are we then to attribute the relative abundance of rain to the forests, or are we to look upon the presence of forests as a consequence of abundant rain? The following observation may, perhaps, help us to answer the question :—

Within the memory of man, all the forests which have disappeared have been destroyed by causes other than drought, notably by fires ; and wherever forests have been destroyed, drought has followed. Take the climate of George Town as, perhaps, the best-known instance.

Less than 50 years ago, the whole mountain was wooded, the

forests extended from the mountain to within a short distance of the town, and its climate was considered much too damp; for rain fell nearly every day in summer. At the present time, and ever since the great fire in 1869, followed by other numerous fires,—parts of the district are, indeed, still wooded,—the large forests near the town have disappeared. The rainfall in 1882 was only 24 inches for 96 days of rain, which, judging by the complaints of the inhabitants, was a very inadequate supply. Here, then, we see the forests destroyed by other causes than drought, and drought following their destruction.

It is to be hoped that this colony will progress quickly and safely, and learn that forests mean moisture, and, in accordance with the law established in other countries, she will see a bountiful return of moisture when her mountains are re-clothed with forests.

Before the year 1883, the colonial forests were worked according to the regulations of 1875, which was a step in the right direction, and well worthy of serious consideration.

The regulations of 1883 are framed to arrest the destruction of the forests, and to commence their restoration.

Detailed instructions, theoretical and practical, are given to the staff charged with bringing about the reforms so much to be desired. The method to be observed in marking trees is fully described in special instructions.

The reports of the Superintendent of Woods and Forests for 1882 and 1883 show the progress made during these two years—that for 1883 contains on page 33 an example of a forest series, introduced in accordance with the new regulations.

The object of these remarks is to give a true idea of the position of the colony as regards forestry in connection with the exhibits in Class I.

The exhibits in Class II. are grouped according to the climate of the districts in which they grow. In reference to climate, the colony is divided into several very distinct zones.

1. The south-west extends from Cape Town to the Gamtoos River, and receives more rain during the winter than the summer; from a forester's point of view, it is characterised by the Stink-wood (*Oreodaphne bellata*—Nees ab E.) and Assegai-wood (*Curtisia faginea*—Ait.);

2. The south-east, on the contrary, has more rain during the summer season, and the forests in this division abound with Sneezewood (*Pteroxylon utile*—E. and Z.);

3. The west embraces the mountains, on which are still found specimens of Cedar trees (*Widdringtonia juniperoides*—Endl.);

4. The north comprises the borders of the Orange River, where the Cape Ebony (*Euclea pseudebenus*—E.M.) and Camel Thorn (*Acacia giraffa*—Wild.) are indigenous;

5. The central, in which the Doorn Boom (*Acacia horrida*—Wild.), Karreewood (*Rhus viminalis*—Vahl), and Witgatboom (*Capparis albitrunca*—Burch) are found. These, though not numerous, prove undeniably that forest trees will grow even in places most liable to drought.

The products of these five natural divisions have been grouped into three sections: the first comprises the rare woods of the north, the west, and the central zones, and those usually grown in the plantations; the second, the products of the forests in the south-west zone; and the third, those of the forests in the south-east zone. In most instances there are several specimens of wood for each species; and, as far as possible, a section showing the structure of the trunk, a plank cut in the direction of the medullary rays perpendicularly to the layers of growth. They are sufficiently large to show perfectly the quality, grain, and markings of the different kinds of wood, and the finish to which any work for which they were used might be brought.

The collection has been prepared with the assistance of all the officers of the Forest Department, of Prof. Peringuey, and of all the gentlemen who have contributed various specimens, amongst whom may be mentioned M. le Vicomte de Montmort, of Mariedahl, who has presented many specimens of woods long naturalised in the neighbourhood of the Cape.

(To be continued).

DEHRA DÚN FOREST SCHOOL.

THE indoor portion of the theoretical course of instruction at the Dehra Dún Forest School was closed on the 31st October, when the list of prize holders was read out by the Director.

The principal changes which have taken place since last year are a complete separation of the course of Morphological and Physiological Botany from that of Sylviculture, to which it formerly formed an introduction, combined with certain elementary teaching regarding soils and climates, which have now been relegated to the Natural History course.

Sylviculture is no longer taught in the lecture room, but in the forests of the School Circle by the Deputy Director, who has been freed from all executive forest work. Lectures on Utilisation and the elements of the Organization of Forests have also been added to the course, which will conclude in November-December with practical work in forest estimation and working-

plans in the Dehra Dún forests, and a visit to the Changa Manga and sailaba plantations near Lahore, and in the Pabbi reboisement works near Jhelum.

The junior students who during November and December learn practical surveying under Mr. Martin of the Forest Survey, and are working this year in the forests on the right bank of the Ganges river, will return to Dehra Dún early in January, and study sylviculture and utilization of forest produce in the Dehra Dún and Jaunsar Forests under Mr. Fernandez till the 1st July, when the indoor theoretical course will re-open.

The preparation of manuals for instruction at the Forest School is in progress, that on Sylviculture by Mr. Fernandez, on forest Vegetable Morphology and Physiology by Mr. Fisher, whilst Mr. Hearle, who teaches Systematic Botany to the second year students, has already published a pamphlet on Geographical Botany.

The study of Entomology, at the Dehra Dún Forest School, was specially provided for by the Secretary of State, and Mr. Clifford was selected from the Nancy students who had qualified in 1881 for employment in India, and after studying the subject specially under Professor Huxley and at the German Forest School at Tharandt, arrived at Dehra in December 1882.

A study of Entomology pure and simple has been considered too special for the Rangers' Class, and Mr. Clifford's course of lectures has been expanded so as to admit the study of all injuries and diseases incident to forest plants, whether by animals, insects or other plants, such as climbers, epiphytes, parasites or fungi, as well as the decay and preservation of timber; to this subject the title of Forest Etiology has been given, but it would probably be better to style it *Forest Protection*, corresponding to the German, *Waldschutz*, though this term may perhaps be considered too comprehensive in many respects, and does not properly include the preservation of wood and timber from decay.

The want of a general entomological museum in India for identifying species sent to the Forest School to be determined is greatly felt, and it is hoped that the Agricultural Department, which is at least equally interested with the Forest Department in this question, will take steps to supply this great want.

The American Commissioner of Agriculture has an Entomologist to assist him, and why should not India, which like the United States, is a great agricultural country, be similarly favored ?

Another addition to the course of instruction at the Forest School has been the opening of a Vernacular Class, in which instruction is given in Hindustani by the Deputy Director. This is as yet only in the experimental stage, and the men sent this year to attend the Vernacular Class are not been suffi-

ciently educated to profit much by what they hear. The fact is that, only the Central and North-West Provinces may be expected to send men to this class, as the Punjab has always plenty of candidates for the English course, and in other Provinces, Hindustani is not the vernacular.

Several men who have attended the School course have already been promoted to the grade of Sub-Assistant Conservator, of whom we may note—

1 in Ajmere.
1 in N.-W. Provinces and Oudh.
2 in Central Provinces.
1 in Assam.
2 in Bengal.
1 (probationary) in Burmah.

The number of students attending the School has been—

18 in Senior Class,
10 in Junior Class.
Three Forest officers of the superior staff, and an officer in the Canal Department, also attended a portion of the course.

One of the most promising features in connection with the Forest School, is the rising interest which the Native States of India are taking in it.

The following students from Native States have already been deputed to the Forest School :—

2 from Patiála.
1 „ Kapurthala.
2 „ Baroda.
4 „ Jaipur.

Four men are also expected next year from Mysore and one from Rewah.

Madras thoroughly supports the School, and six men have already been sent from there to qualify for the Rangers' certificate, but the Bombay Government holds aloof, and sends its men for their training in forestry to the Poona College of Science, though it does not appear probable that they can have such good opportunities of obtaining practical instruction there as in the forests of the School Circle, with its specially trained staff of instructors and the cooperation of the Forest Survey Branch, the head-quarters of which are in Dehra.

Six men attended the Foresters' Vernacular Class, the instruction of which will be continued by the Deputy Director in the forest till July 1885.

The list of the marks obtained in the Final Examinations and of the prize-holders is given below :—

Second Year's Course, 1884.

Names.	Province.	Physiological Botany.	Road making and Building.	Physical Science	Mathematics.	Surveying.	Forestry.	Systematic Botany.	Etiology.	Law.	Grand Total.
	Full marks,	300	40	720	720	600	900	720	360	360	4,720
a Tara Kishore Gupta, ..	Assam, ..	291	29	702 *b*	296 *b*	514	580 *b*	652 *b*	350 *b*	342	3,756
a Har Sarúp, (I.), ..	N.-W. P. School Circle,	230	32	647	531	350	762	557	294	342 *b*	3,745
Gokal Dás, ..	Punjab, ..	268	32	619	458	377	615 *b*	579	270	348	3,566
Thakúr Dás, ..	Punjab, ..	263	16	496	389	352	760	521	284	338	3,419
Ghulam Mahomed, ..	Punjab, ..	256	21	598	328	429	698	487	278	286	3,381
V. S. Guru Natha Pillai, ..	Madras, ..	239	37	553	514	449	467	484	304	310	3,357
Sada Nand, ..	N.-W. P School Circle,	229	24	569	396	372	468	576	314	338	3,286
Narayan Prashad, ..	C. P., ..	258	29	595	355	388	460	505	306	330	3,226
Tinkauri Chaudhari, ..	Bengal, ..	212	†	469	288	525	627	541	220	184	3,066
Mansúkh Rai, ..	Punjab, ..	196	27	487	218	463	572	519	228	304	3,014
Rakhal Dás Mukerji, ..	Bengal, ..	213	21	494	234	306	707	512	178	342	3,007
Moung Shway Hka, ..	Burmah, ..	185	†	578	168	520	580	479	192	288	2,990
Jai Kishen, ..	Punjab, ..	271	21	571	206	377	433	492	262	338	2,971
*Atma Rám, ..	Punjab, ..	217	13	514	345	421	417	481	200	272	2,880
Moung Thakadoc, ..	Burmah, ..	150	†	517	58	522	619	397	236	294	2,793
* Gour Krishna Sarkár, ..	Bengal, ..	198	11	297	98	371 *b*	562	329	124	190	2,180
* Abdul Rahman, ..	Madras, ..	160	18	398	115	533	247	308	112	148	2,034
* Har Sarúp, (II.), ..	N.-W. P. School Circle,	153	16	303	282	331	138	199	174	208	1,804

* These men have failed to qualify for the Rangers' certificate. Differences of marks of less than 1 per cent. are not considered in precedence, or in awarding prizes.

† This subject was not taught in the first year's course for these men. Hence the grand total of full marks for them is 4,680.

a. These men divided the Director's prize for General Proficiency.

b. Prize holder in each subject.

Mr. Moir's prize for Forestry, ... { Har Sarup, I. / Thakúr Das. } *æq*:

Mr. Hearle's prize for best Herbarium, ... T. K. Gupta.

Mr. Chester's prize for best Essay on Natural Forest reproduction, ... } not yet adjudged.

Dr. Schlich's prize for best Note Book, ... }

The total value of the prizes distributed was Rs. 460, besides Rs. 70 for gymnastics, of which Rs. 50 was given by Mr. Broun.

Road-making and engineering was taught only in the first year, and hence the total number of marks appear inadequate, but this will be remedied in future years.

For the Junior students, Mr. Moir's prize for Botany was awarded to Keshavanand of the North-West Provinces School Circle, and the Government prize for Road-making and Building was divided by Keshavanand and Sundar Dás from the Punjab. Last year's prize for practical Forestry, which is offered by Mr. Fernandez, was assigned to Babu Jogeswar Súr and Mahadeorao Palnaitkar, who were equal.

We have heard that Divisional Forest Officers find great difficulty in sparing their men from their current duties so as to allow of their deputation to the Forest School, but this difficulty would surely be avoided, were Conservators to keep a small number of Forest Apprentices attached to the Direction, and were to post these men to the divisions to get practical experience of the forests before being sent to Dehra, or to replace temporarily Rangers and Foresters who could thus be deputed to the Forest School without much inconvenience to current work.

The memorandum of conditions of entrance and training of Students at the Forest School are given below for general reference.

Memorandum of Conditions for the admission and training of Students at the Forest School, Dehra Dún, dated the 3rd June, 1884.

Instruction at the Forest School, Dehra Dún, will be given in two courses—one in English for candidates for the Rangers' certificate, the other in Hindustani for candidates for the Foresters' certificate.

2. Candidates who desire to be received at the Forest School will be selected by the Director of the School, *or* by Conservators of Forests acting under such orders as may from time to time be given by the Local Government or Administration under which they are serving.

3. Students must, on admission to the School, be not less than 18 or more than 25 years of age. Exceptions from this rule require the previous sanction of the Government of India. Each candidate will be required to furnish a certificate of sound health, good vision and hearing, from the Civil Surgeon of the station nearest to his place of residence.

4. It will be the duty of the Conservator, or the Director of the School, to satisfy himself that the candidates have a good moral character, active habits, fair powers of observation, and sense of locality, and such other qualifications as are necessary for a Forest subordinate.

5. As a rule, no students will be received at the Forest School who have not proved their fitness for Forest work by service in the

subordinate staff of the Department, whether permanent or temporary, during a period of not less than twelve months.

6. Candidates for the Rangers' certificate must have passed the Entrance Examination of an Indian University. In the case of both an English and an Oriental side existing at any University, the Entrance Examination must have been passed on the English side. Candidates for the Forester's certificate must have passed the Middle Class Examination in the North-Western Provinces and Oudh, or an equivalent standard in other provinces, and they must possess a competent knowledge of Urdu or Hindi.

The condition of having passed these examinations may be dispensed with in the case of candidates who were in the Forest service on the 1st December, 1881, provided that the Director of the Forest School is satisfied that they have attained such a standard of general education as will enable them to follow the course of instruction with advantage.

7. Candidates selected for admission to the School will join at Dehra Dún on the 25th June.

8. The course of training for the Rangers' certificate will extend over eighteen months, and that for the Foresters' certificate over twelve months.

9. During the course of instruction the Director will furnish Conservators of Forests periodically with reports on the application and progress of the students sent by them to the School.

The Director has power to dismiss any student for misconduct, and a student thus dismissed will not be re-admitted to the School. The Director may also remand to his province or circle any student who, in his opinion, is not sufficiently promising.

10. Successful students will, at the close of the course of instruction, receive a Rangers' or Foresters' certificate. Students of special merit may be granted certificates with honours. Students of the Rangers' class who fail to obtain the Rangers' certificate may be granted the Foresters' certificate. Those who have obtained the Rangers' certificate may, on return to their province or circle, be appointed to the class of Ranger. The students who have obtained the Foresters' certificate must serve satisfactorily as Foresters for at least two years after their return from the School before they are considered qualified for promotion to the class of Ranger.

11. No person who has not qualified in the manner here prescribed shall be appointed a Ranger without the special sanction in each case of the Local Government.

12. Candidates from Native States and others will apply, either direct or through the officers under whom they are serving, to the Director, who will deal with their application for admission to the School, as far as practicable, in accordance with the above provisions.

There are a few scholarships of Rs. 20 per mensem at the disposal of the Director of the Forest School, and as the men deputed from the various provinces are fully provided for during their stay in Dehra, these will generally be granted to deserving private students, who are appointed by the Director and attached to no particular province.

DEODAR PLANTING.

As an old Forest Officer, and one who has done a great deal of deodar planting, I trust I may be excused if I say a few words about the system adopted in Kulu, and described at page 466 of your Number for October. I quite agree with the employment of boys, I have always found them much quicker in learning and smarter in planting than either men or women; but as regards the Kulu method, I am sorry to say I cannot see the use of it, and think it must certainly be much more expensive and slower in execution than the system of planting in holes. In the first place I have always found that young deodar of 20 months old are quite strong enough to be planted out, they are then 9 inches high (if below that I never put them out), and I see no use in keeping them in the nursery another year; this however, is a fault on the right side; the parts of the Kulu method to which I would take exception are, the trench and the number of plants used. Of course, lines must be cut through the jungle, otherwise no planting could be done. I therefore pass on, merely remarking that in my opinion 10 feet between the lines is too far. Deodar should be planted in lines not over 5 feet apart; there is no doubt they thrive better and throw out less branches when they are grown close together, and as they are found in dense thickets growing naturally, we can do no harm in this case in following nature. As regards the small trenches made in Kulu, it appears to me that they must be at least four times as expensive as holes, and as four plants are put in a space of 2 feet, it stands to reason that there is a waste of three plants, for it is impossible for four *trees* to exist 6 inches apart. I hold that as it is quite possible to plant deodars in holes 5 feet apart without 10 per cent. of loss, it is therefore sheer waste of material, time and money, to dig small trenches 2 feet long and put four plants within the 2 feet. As for the little dab of mud to stick the plant against the wall, I see no harm in it at all. I am sure many officers must have seen continuous lines of deodar, planted simultaneously, as in the Kalatóp Forest near Dalhousie; as therefore, it is possible to plant successfully at 5 feet apart in holes, I cannot see the use of an expensive trench and the waste of three plants. When I planted deodar in former years (and I have done it with less than 10 per cent. of loss), I worked as follows:—Lines were cut through the jungle, where necessary, at about 5 feet apart, then men with "pharwas" cut deeply into the soil three or four times at points 5 feet apart in the lines, whilst after them came boys or men with "khurpas," who dug the hole to the required depth, leaving the loose soil on the lower side; this was done some days or even weeks before the actual planting took place. Planting was done by boys who had been carefully trained to the work; the plant was held at the

required height above the bottom of the hole, so that the end of the root was not bent or curled upwards, this was then fixed in the earth with a lump of mud, and loose soil from above the hole gently crumbled about the roots and gradually pressed down all round. I consider this plan far simpler than the Kulu one, less expensive, and one that does not require such careful supervision, all of which are of great importance to a Forest officer who cannot always be present when planting is going on. There is really no more difficulty in planting a deodar than in planting a cabbage, the principal things required are that the root shall not be injured in taking out of the nursery, and shall be fixed properly in the earth when planted out. To conclude, I have no doubt the Kulu method gives excellent results, but I maintain that it is a tedious and expensive one, and as long as single plants can be successfully planted out at 5 feet apart in holes, it is quite unnecessary and wasteful to put four plants in a space of 2 feet, seeing that at some time or other three of them *must* be lost.

G. SPARLING,
retired, Deputy Conservator of Forests,
late of Jhelum Forest Division.

DALHOUSIE :
31st October, 1884.

OFFICIATING APPOINTMENTS.

WILL any one tell me what are the rules about officiating appointments in the case of a man going on privilege leave. There seems to be an impression, that privilege leave gives no officiating appointments, on the theory that Government is not to be any loser in such cases. The remainder of the establishment must carry on the work, but there is to be no extra cost to Government.

Yet we had a case the other day of a 1st grade Deputy Conservator taking three months privilege leave, and the vacancy was filled up by officiating appointments just as in the case of furlough. Cannot other provinces do as Bengal? And is the Forest Department under different rules, in such cases, to other Departments?

SCARABI.

Note.—The grant of privilege leave on the theory that Government is not to be any loser in such cases, is only restricted to the case of an officer whose pay is less than Rs. 100, sec. 127 of the Civil Leave Code, which lays down that "Leave may be granted to an officer, whether he be in Superior or Inferior "Service, whose pay is less than Rs. 100, so far as it can be done without im- "posing any cost upon the State, &c., &c."

But it does not preclude the appointment of another officer for the time: Rule 2, sec. 76 of the Civil Leave Code, lays down as follows:—

"An officer on privilege leave is entitled to leave allowances equal to his "salary, even though another officer be appointed to act for him."

Again, sec. 5 of Pay and Acting Allowance Code provides that—

"No acting allowance is given to an officer acting in a higher appoint-
" ment in consequence of the absence of another officer on privilege leave, for
" the first 30 days of such leave, unless the acting officer is transferred from
" another station, in which case he may draw three-fourths of the acting al-
" lowance otherwise admissible."

And Rule I. under the section states that—

"As a general rule, the duties of an officer absent on privilege leave should
" be discharged by another officer at the same station. Only in exceptional
" cases, where there is absolutely no officer available on the spot can the depu-
" tation of an officer from another station to act, in consequence of the absence
" of an officer on privilege leave, be allowed."

It will be thus seen that though there is no direct provision as to the disposal of the officiating appointments in a higher grade, vacant consequent on the substantive holder in an appointment going on privilege leave, yet there is nothing against *officiating* appointments consequent thereon. But the case is optional with the Local Governments, and there is nothing in the Civil Leave Code, or Acting Allowance Code, special for Bengal which does not apply to any other province.—[ED.]

FLOWERING OF MANGO TREES.

ADVERTING to the question of second flowering of mango trees raised in your October Number of the "Indian Forester," the following account may, perhaps, be worth the while of your readers.

The second flowering of the mango tree in the winter does not seem to be a singular phenomenon, but one of general occurrence, though confined to a small number of trees, and is more or less a habit with them. It is very common in the Southern Presidency, and is generally known as *Kar kai* in Tamil (mango pertaining to the Tamil calendar month of *Karthigai*, corresponding to English November or thereabouts), and the people naturally expect it at this season of the year. I cannot speak with authority as to the fruit being abortive or otherwise, but the mango is none the worse for its being *out of season*, certainly not in Madras, as it is universally known that there is a season for winter mangoes.

It may be well to note here, that one of the mango trees, by no means of the best species, in the small garden attached to the Madras Forest office, flowered unlike the rest, at an unseasonable time this winter, and after the flowers had become developed into small mangoes, they looked blasted, and bunches of small rotten mangoes, quite black, are still observed on the trees. This last is perhaps owing to the late heavy rains that have set in? An old gardener of nearly three score and ten tells me that he has known this tree to yield a second crop for the last fifty years and more, and adds that it also produces good fruit.

MADRAS:
20th November, 1884.

A. R.

JJ. Reviews.

ANNUAL REPORT OF THE DIRECTOR OF AGRICULTURE, BOMBAY, 1883-84.

We welcome the first annual report of the Agricultural Department of the Bombay Presidency. Mr. Ozanne of the Cirencester Agricultural College has, in the words of the Government resolution, entered on his duties with much activity and intelligence, but of course for the first year of his holding office as Director of Agriculture his time has been chiefly spent in organizing, and much progress in the way of results cannot be expected.

The object of the Department in Bombay are thus explained in the resolution—

"The principal objects in view are to place under skilled, central and systematic direction the experiments which have been hitherto desultory, fragmentary and unscientific, and which have therefore frequently failed; to maintain a continuous record of experiments and observations; to aid and encourage higher cultivation, so that the producer may fully avail himself of the rapidly increasing facilities for export trade; to bring the producer into communication with the exporter of produce; and at the same time to acquire that command of agricultural facts and statistics which is necessary alike to the Government and to the agents of commerce."

Mr. Ozanne also states in the report—

"The following specific duties which have been laid upon the Director may be enumerated :—

(1). The compilation and maintenance of an analytical study of each district with a view to ascertain its need for protection against famine.

(2). The preparation of agricultural statistics.

(3). The maintenance of the statistical record which is placed before the authority entrusted with the revision of rates of assessment.

(4). The subjecting of the reported results of crop experiments to careful analysis and criticism, and the conduct of personal test experiments as far as possible.

(5). The supervision of the experimental farms and the direction of all technical operations thereon."

Since his appointment he has been principally engaged on the compilation of a Draft Famine Code, and in visiting the Saidapet Agricultural College, Madras, and experimental farms, &c.

It is intended to establish his head-quarters eventually at Poona, where the Bombay Agricultural College is established, and in future reports we hope to hear more about the College, and especially regarding the Classes for teaching Forestry which are established there, and which are not referred to in the present report. We have already in a previous Number plainly adverted to the probable advantage which the Bombay Government would find in sending their Forest Apprentices to be trained at the Dehra Dún Forest School, instead of at the Poona Agricultural College, where it is not likely that the small province of Bombay can afford to maintain a competent staff of professionally trained Forest Officers for the instruction as is done in Dehra, and where the fact that Dehra is the head-quarters of the Imperial Forest Survey ensures that a thorough knowledge of surveying, so important for Forest Officers, can be acquired.

The Madras Government have an Agricultural College, and yet send their Forest Apprentices to Dehra, and even the Native State of Baroda, which is we believe subject to advice from the Bombay Government, has sent four Forest Students to Dehra. We hope that no petty jealousy of the Government of India will prevent the Bombay Government from sending its future Forest Officers to the Dehra Dún Forest School, where even the Ceylon Government have been advised to send theirs.

We append some extracts from Mr. Ozanne's report which are of special interest to Forest Officers—

"MEASURES OF PROTECTION, INCLUDING—(*1*), *Fodder Reserves and Arboriculture;* (*2*), *Extension of Communications;* (*3*), *Irrigation.*

"On this head I have little to say. I would only refer to *bábul* (*Acacia arabica*) plantations. A hope has been raised by enquiries made all over India that a profitable export of *bábul* pods for tanning purposes may arise. As a test of the probability of profitable export a quantity of pod shells has been sent to England. I have put myself into communication also with Messrs. Fischer & Co., who, at the request of the Trades Association in Berlin, are making enquiries. Sample bags were sent to Messrs. Fischer & Co. A reply has come that all the tanners and dyers interested in the subject show reluctance to make any offer till they know the exact price at which the article can be supplied, and till they have satisfied themselves whether the importation can be made to pay. Whether the export will arise or not, the importance of encouraging the extension of *bábul* to provide fuel and fodder reserves, specially in the treeless Deccan, cannot be denied, and has been fully recognized by Government (Government Resolution No. 6282 of 5th August, 1884). 'The cultivation of *bábul* should be encouraged as largely as possible, and the district officers should use every endeavour to induce holders of land and other persons to undertake to form *bábul* plantations on lands suitable for the purpose near their villages. Government will be prepared to grant any reasonable concessions which may be considered necessary in dealing with applications for land.'

"The subject of arboriculture is dealt with in the Forest Reports,

and as regards road-side tree plantation in the Administration Reports. There is one point, however, where the interests of agriculture appear to conflict with those of the aims of the Forest Department, and which therefore requires special attention by the Agricultural Department. I refer to the *ráb* question. Some Forest Officers on the one hand contend that the use of brushwood for *ráb* is unnecessary, and that as the people have no 'right' to denude the hills by lopping the trees and bushes, 'the permissive privilege' should be denied them. On the other hand the Revenue Officers assert that *ráb* of brushwood is absolutely necessary in certain districts to produce good rice and other (*nágli* and *vari*) crops. The Commissioner, C. D., as far back as 1880, while admitting that it is in the very highest degree necessary to curtail, as far as practicable, the system of destruction of trees and underwood for *ráb*, pointed out that change in the system must not be too suddenly enforced against the cultivators. He suggested that suitable areas should be selected in each village, planted and looked after by the Forest Department, and worked for *ráb* under the supervision of that Department. This suggestion was fully approved by Government, and ordered to be carried out. How far it has been carried out I have not had an opportunity of ascertaining. At the same time careful experiments were directed to ascertain whether the assertions of the Forest Conservator, N. C., that the use of brushwood for *ráb* can be avoided by the use of grass alone, grass and cow-dung, and grass, cow-dung and fallen leaves, are well founded or not. These experiments have been conducted for three years, but owing to misunderstanding of the details of *ráb* and its objects they have proved nothing. I have made a beginning in the study of the subject. My letter No. 501 of 9th June was printed on 30th August, 1884, in the *Indian Agriculturist*. The chief point ascertained so far is that the manurial value of *ráb* is one of its least important properties, and very far from being the chief one as is evidently the opinion of the Forest Conservator, N. C."

Regarding this question the following extract from the Government Resolution is also useful :—

"While at Igatpuri the Director made some investigations on the use of *ráb*, and wrote a useful note on the subject. Mr. Ozanne considers that the opinion held by the natives that the chief use of *ráb* is to roast the soil rather than to act as manure is substantially correct, the object of the roasting being apparently to destroy the germs of vegetation which would choke the young plants. Material producing great heat would therefore appear to be indispensable, and there would seem to be no available substitute for brushwood. The experiments conducted by district officers under the orders of Government appear to have been performed unsystematically, and to have yielded no important results."

"Mr. W. F. Sinclair, Bom. C.S., has prepared a very careful pamphlet entitled "Notes on Arboriculture in the Bombay Presidency." The copyright was offered to Government, and the offer was accepted. The pamphlet has been extensively distributed. It is intended as a manual for District Officers, Engineers, and members of Municipal and Local Fund Committees to assist them in the plantation of roads, camping grounds, tanks, canals, and the like.

"*The Carob Tree* (*Ceratonia siliqua*).—In June 1883 at the suggestion of the Government of India, experimental cultivation of this tree was ordered in the coast districts. Instructions as to the best modes of cultivating the tree, together with a memorandum by the Principal Forest Officer, Cyprus, were circulated.

"In 1881 an earlier experiment had been made which seemed to show that success might be expected in the moist climate of the districts below the Ghâts.

"The later trials were not encouraging. In Thána the seed was received late and the trial deferred. In Kánara, Kolába and Ratnágiri little prospect of result is afforded. In Surat 150 plants at Dumas remain from the early experiment. They vary from 2 to 4 feet in height. There are trees 7 feet high in the Public Park at Surat, but only five survived the heavy floods of July 1883. The Forest Officer of Ratnágiri states that 720 seedlings reported to be alive in May 1882 have all since died; a progress report will be due in May 1885.

"On the Government Farm, Khándesh, there is a considerable number of well established trees which fruited freely this last season.

"The tree will never pay if the object of its cultivation be to produce locust beans for export. These beans are used extensively in England and elsewhere as an ingredient of cattle food on account of the large percentage of sugar they contain; but the manurial value of locust beans fed to cattle has been shown to be very low. It may prove useful in times of drought."

There is also a lengthy account of the results of some experimental silos, regarding the results of which we give the following extracts:—

"*1st—Experiment with an elephant.*—200 lbs. of ensilage were given daily from 10th April without any flour or kadba. Finding that he quickly consumed the ration and still seemed hungry, it was increased on the 12th to 300 lbs., and again on the 19th to 400 lbs. From the avidity with which he ate it, it was supposed that it was not satisfying. This ration was continued till the 25th April, when the elephant was measured. The measurement disclosed a falling off of 5 inches round the fore-arm. 'It was evident,' says Colonel Griffith, 'that the ensilage was not suitable as a ration, and I therefore directed that he should revert to his ordinary food.' The elephant ate all the heads and leaves of the ensilaged stuff, but not all the stalks. It would have been better if other measurements had been taken. It is not stated whether the elephant showed other marks of bad condition.

"*2nd and 3rd Experiments.*—Six mules receiving 15 lbs. ensilage each, over and above the ordinary grain ration for 42 days; six others receiving 30 lbs. ensilage without the usual grain ration for the same period.

"Of the first six two only fell off at the end of the experiment, while each of the other four which fell off after 24 days, pulled up again after 8 days on the same ration and without any decrease of work. The same cannot be said of the other six, all of which, with one exception, fell off considerably. The final weight of the mules was not taken as they were suddenly ordered off.

"They all took to the ensilage very kindly, and it was found by damping the dry portions with water that the mules would eat what they had previously left unfinished.

" 'My belief is that had the experiment been carried on for a period of 3 months the mules which received it as a substitute for dry grass would have put on considerable weight, but I am doubtful as to the others, who though receiving a double ration of ensilage received no grain. The general appearance of all the mules was greatly improved, even of those which fell off in weight. Their coats shone and they became as sleek as mice.'

"*4th Experiment.*—'During the whole of May and eight days of June four sick and weakly mules received ensilage in addition to their ordinary ration with most favourable results. Their condition greatly improved, and that was without doubt attributable to the ensilage.'

"Mr. Woodrow reports that he received 4,200 lbs. of ensilage which was fed to 10 bullocks in regular field work at the rate of 20 lbs. each daily with 2 lbs. of gram. The cattle were in poor condition when the ensilage was begun in April. After three weeks they had greatly improved and were in 'fine working condition.' Ensilage was stopped, because the supply was required for the Commissariat experiments above referred to.

"I have unfavourable opinions also to notice.

"Some of the ensilage was issued to the Commissariat Farm at Alegaon. Six slaughter cattle and ten sheep were fed at the rate of 10 lbs. to the former and 1 lb. to the latter for a month. The cattle are reported to have shown much repugnance at first, but latterly they showed a preference for it. They lost in weight. The sheep would not or could not consume the quantity given.

"The final result is thus described:—'Every part of the cattle and sheep offals bore evident signs of the effect of the forage. They were found to be quite black. Even the kidney fat of the cattle showed a slight tinge of purple colour.'

"As to this experiment I may remark that the sheep left more than half their ration untouched. They thus had to live for one month on ½ lb. of ensilage a day—an amount of food totally insufficient to keep them in condition however good. No scientific *post-mortem* examination was made; without that no satisfactory explanation of the abnormal appearances is possible.

"On the whole it is clear that even whole bájri and jowári can be preserved in an iron tank above ground; *à fortiori*, therefore, grass which packs more easily can be kept in a cool masonry tank wholly or partially under ground. The experiment also proves that even inferior ensilage is a good food, especially in partial substitution of the ordinary food of animals."

FORSTLICHE BLATTER for April 1883 contains a description of a self-registering gauge for measuring the diameter of trees. The general form of the instrument is that of the ordinary gauge, the registering apparatus being attached to the moveable arm. Over the scale of the gauge is stretched a narrow strip of paper, divided into centimetres or inches, on which, as each

measurement is taken, a mark is made by means of a pointed style, worked by pressing the finger on a button. The mark so made shows the exact diameter of the tree, and when the measurements are completed, it is merely necessary to detach the paper and count the number of marks in each division, in order to obtain a complete record of the trees measured. The same movement of the finger which makes the mark on the paper, sets in motion a simple contrivance, by means of which the number of measurements taken are registered on a dial, and a check is thus afforded to the record on the paper. The liability to error that would arise if several trees happened to be of exactly the same diameter, is reduced to a minimum, by an arrangement by which the style is made to travel gradually backwards and forwards across the paper. As many as 3,000 measurements can be taken without renewing the paper, but it is considered better to replace it oftener.

In four experimental measurements, the difference in readings between the dial and the strip of paper was as follows :—

In	1,200	stems	measured	a difference	of ...	19
„	1,606	„	„	„	...	10
„	614	„	„	„	...	8
„	500	„	„	„	...	1

The gauge cannot be used during wet weather; and where it is necessary to distinguish different kinds of trees, a separate gauge, with a man to work it, is required for each species to be measured.

The cost of the instrument is from £2 to £2-10-0, and it can be obtained from Messrs. Kraft and Sons, Instrument Makers, Theresianumgasse, Wieden, Vienna.

III. Official Paper.

REPORT ON THE BOX-WOOD SUPPLY IN THE PUNJAB.

The box-wood tree (*Buxus sempervirens*) is found in the Punjab in the following localities :—

Bashahr Division—
Neogli Range, on the Neogli River.
Pindrabis Range on the Gunagad.
on the Kenchagad.
on the Wangar.
Tranda Range, at Nachar.
at Panwigad.
Kilba do. from Panwi to Punang (left bank).
from Punang to Sholtu.

Beas Division—
(Kulu)
Janga Kootka forest.
Gran Nal „
Bitr Kanda „
Ladag „
Tiker „

Chamba Division—
(State forests unreserved).
Bhiani Nalla.
Valley of Suil Duir Ilaqa.

Jhelum Division—
(Shahpur Salt Range) Khusab rakhs.

Rawalpindi Division—
Margala and Khairi Murat reserves.

The total area known at present which is covered with box-wood, is estimated at 1,387 acres, as follows :—

Rawalpindi Division, ...	500	acres.
On this area, box only forms $\frac{1}{10}$th of the vegetation, rarely occurs pure, and then only in patches of a few square yards.		
Beas Division, ...	50	„
Bashahr Division, ...	820	„

This area is made up in the greatest part by the three following forests :—

Morul, ...	211	acres.
Kashapat, ...	164	„
Kunalung, ...	365	„

In all three areas, box is plentiful, 37 acres of Morul and 21 acres of Kashapat being a pure and dense forest.

Chamba Division.—It grows on only 17 acres, but of these 15 acres is nearly a pure forest.

Jhelum Division.—The box-wood here is scattered in small patches all over the Khusab rakhs and forms no continuous area.

The forests in which the box-tree is found differ most widely in elevation, climate and soil.

In the Margala reserve, the tree grows at an elevation of from 2,000 to 3,000 feet; in the Shahpur Salt Range, from 3,500 to 4,000; in the Bhiani Nalla in Chamba, at about 6,500; in Kulu, at about 7,500; and in Bashahr, at an elevation of from 6,000 to 8,000 feet.

Again in Margalla, it grows on decomposed triassic limestone; in the Salt Range, on a sandstone formation; in Bashahr, on sandy beds formed of decomposed clay, slate and gneiss; and in Chamba, on a rich vegetable mould overlying mica schist.

The tree is, however, constant in one respect as regards its habitat, and thrives in moist and sheltered places, hugging the alluvial deposits along the banks of perennial streams, and it does not thrive where it is exposed to winds, may they be hot and dry, or cold and frosty. It also avoids the hot sides of the valley, and evidently prefers a north-west and northerly aspect.

The *sine quâ non* for its growth, are moisture and shelter, and though the tree grows in the Shahpur Salt Range, where the rainfall is small, and the daily ranges of temperature and the seasons are extreme, it only attains the proportions of a shrub, and its large distribution over this area is at present of no commercial value, but is to me a certain proof that the Salt Range was once well wooded, and could boast of a very much better climate and vegetation, of which the box bushes are a remnant.

The leaves of Salt Range box have a rush-coloured tint instead of the dark chrome green, in more favourable localities. In the Margalla reserve, the trees are somewhat better, but they reach perfection only in Bashahr, especially on the Neogli river, where they attain a girth of 4 feet, and with a height of 30 feet, grow clean boles from 10 to 15 feet in height.

The annual growth in the Bashahr forests is also much superior to the increase in any other part of the Province, and countings of annual rings, which, however, have not been very numerous, show an average of 18 rings per inch radius in Bashahr, against 28 rings in Chamba, 30 in Kulu, and from 30 to 40 in Rawalpindi. According to these figures, it would take 72 years in Bashahr, 112 in Chamba, 120 in Kulu, and 120 to 140 years in Rawalpindi, to grow a first class workable tree of 24 inches girth.

As stated in para. 3, the box-wood growing area is estimated

at 1,387 acres, of which, however, only a very small area contains pure box forests. As a rule the tree is found intermixed with horse-chestnut, maple, hazel and walnut, and being a much slower grower than any of these trees, it is mostly suppressed.

It is consequently very natural that the tree grows quicker and to finer dimensions in pure forests.

The mature stock at present on the ground has been counted, and amounts to 7,707 trees above 2 feet in girth, which are distributed as follows :—

Bashahr, ...	7,047
Beas (Kulu), ...	520
Chamba, ...	140

Besides this, a growing stock has been enumerated of 16,851 young trees in the Bashahr forests, and of 600 in Chamba.

From the Rawalpindi Division, it is reported that nearly all trees over 4 inches diameter are rotten in the centre.

In the Bashahr Division, natural reproduction in pure forests is all that can be desired, and all that is required is to cut out the mature timber and to close the forest against the grazing of goats. In mixed forests, the reproduction has been prevented by the dominant trees, the box bearing no seed under the dense shade.

The natural reproduction in the small area found in Chamba is reported satisfactory ; in Kulu, as only fairly good, and very poor in Rawalpindi.

With regard to the commercial value of the forests, the cost of extraction has first to be taken into consideration, which, per ton, amounts to, in the—

			Rs.
Bashahr Division to	Phillour, ...		131
„	Umballa, ...		132
Beas „	Amritsar, ...		125
Chamba „	Pathankote, ...		147
Rawalpindi „	Rawalpindi, ...		7
Jhelum „	Bhera, ...		13

Next we have to consider the local value, and the following are the prices, as far as can be ascertained, obtainable in local markets :—

Rawalpindi,	Rs. 6	per maund, or	Rs. 168 per ton.
Amritsar,	„ 5 to Rs. 7	„	„ 140 to Rs. 196 per ton.
Simla,	„ 7	„	„ 196 per ton.
Jhelum,	„ 4	„	„ 112 „

About Rs. 3,000 worth of box-wood is bought annually in Amritsar.

The export prices quoted, are £24 per ton weight landed in London.

From experiments made in the Bashahr Division, the green wood gives 28·64 cubic feet per ton. Now in the Kashapat

and Morul forests alone the cubical contents of mature trees have been reckoned at 28699·1 *cubic feet*, of which 20030·6 is first class and 8668·5 is second class : the lower half of tree being taken as first class, and the remainder as second class.

Thus then from these forests we can obtain a present stock of 1,001 tons,—699 tons 1st class, and 302 tons 2nd class.

I have heard that a consignment of box-wood made by the School Circle, North-West Provinces to Churchill and Sims, London, cost for carriage to London (including agency charges) *viâ* Karachi from Saharanpur, at the rate of Rs. 3-6-1 per maund, or Rs. 94-10-4 per ton.

The cost in carriage between Saharanpur and Umballa is Re. 0-1-9 per maund, deducting this from the above, I find that box-wood from Bashahr could be landed in London at Rs. 91-9-4 + Rs. 132 (carriage to Umballa)=Rs. 224 per ton. Taking the exchange at 1*s.* 7¾*d.*, this is an expense of £18 8*s.* 8*d.* per ton for the box-wood consigned to London.

The price quoted at home is £24 per ton weight.

It will thus be seen that by exporting the first class wood we will realize, it is estimated, a net profit of Rs. 75 per ton, or Rs. 35 above the price which it would fetch in the local market.

The net value of the Bashahr box forests, which are the only ones that need be taken into consideration as regards immediate exploitation is therefore—

		Rs.
700 tons, at Rs. 75 profit,	...	= 52,500
300 „ „ 25 „	...	= 7,500
	Total,	... 60,000

I roughly estimate that with strict protection and the gradual thinning out of dominant trees of other kinds, the present growing stock will replace the mature stock in 24 years, in which time the present mature timber may be extracted, reproduction being insured at the same time.

It will not, of course, be possible to secure an annually recurring out-turn, for the difficulties as regards working are against this ; and I propose that the forests should be exploited in four cuttings in 1884-85, in 1891-92, 1899-1900, and 1906-1907.

As regards the box-wood forests in the other Divisions, I can as yet only recommend their strict protection and, if necessary, fencing. In the meantime, experiments with regard to artificial reproduction of box have been instituted in all the Forest Divisions concerned.

BERTH. RIBBENTROP.

JJ. Timber Market.

CHURCHILL AND SIM'S WOOD CIRCULAR.

London, *November 5th, 1884.*

East Indian Teak.—We have in the docks 8,897 loads, against 2,954 loads last year ; the deliveries for the month have been no less than 1,357 loads, against 825 loads last year ; bringing the total for the ten months up to 8,925 loads, against 9,186 loads delivered in the first ten months of 1883. There has been a considerable improvement, both actual and prospective, during the month ; the low rates to which this market has been forced have told their tale, the wood has been driven largely into consumption for general purposes, and floating cargoes have been sent to other markets whenever practicable.

Staves.—There has been quite a lively business in *Dantzic* staves during October ; a large proportion of the dock stock having changed hands, and prices have advanced £5 to £10 per mille of full-sized Pipe. *Memel* and *Odessa* have also participated in the advance. The dock stocks remain about the same. Very little doing in *Bosnian*. *Quebec Pipe* are quite neglected. *United States* feel the depression of our Colonial and South African markets.

Mahogany.—This market showed a great increase in activity during last month ; the arrivals were heavy, and the sales fully proportionate, a large quantity of wood being disposed of at prices which clearly showed a firmer tone.

Walnut-Wood.—*American Black.*—Lower quality logs have been selling rather more freely, and at somewhat better prices, and for prime logs figures are well maintained.

Ebony.—*Ceylon* and *Bombay.*—Wood of good sizes, fairly sound and free from knots, would realise full prices ; small, faulty logs are rather dull of sale, but the stock of all descriptions is light.

Boxwood.—*Persian.*—The demand is dull ; prices rule low in consequence of heavy imports.

		£	s.	£	s.
Oak Staves—		per mille pipe.			
Memel, Crown Pipe,	...	... 180		to 190	
Brack,	...	...		to 145	
Odessa, Crown Pipe,	...	... 180		to	
Danzig, full sized,	...	... 160		to 165	
No. 1,	...	... 128		to	

	£	s.		£	s.
Oak Staves —	per mille pipe.				
Canadian standard Pipe, ...	75		to	85	
Puncheon, per 1,200 pieces,	20		to	23	
Bosnia, single Barrel, ...(nominal)	27		to	30	
United States, Pipe, ...	40		to	60	
Hogshead, extra heavy and double extra,	25		to	35	
Indian Teak, ... per load,	11	10	to	16	
	per foot superficial.				
Mahogany—		d.			d.
Honduras, ...		4½	to		6½
Satinwood—					
East India, ...	6		to	8	
Rosewood—					
East India, ...	5		to	6	
Ebony, Ceylon, ...	9		to	14	
Bombay, ...(nominal)	8		to	10	
Boxwood, Turkey, ...	5		to	20	

SALES OF BOX-WOOD IN LONDON FROM THE HILL FORESTS OF THE NORTH-WESTERN PROVINCES.

Two consignments of box-wood were sent last spring from the Hill Forests in the upper Bagarathi (Ganges) and Jumna Valleys to Messrs. Churchill and Sims, London, and the results of the sales are given below :—

Bagarathi Valley Box-wood.

Auction receipts for 31½ tons, at £25 and £24 per ton, less discount—

	Rs.	£	s.	d.
Sale and dock charges,...	8,652	772	10	0
Charges—		Rates.		
Cutting and carriage from forest to Rajpur, 700 pieces, 981 cubic feet, ...	1,392	per c.ft. 1	8	0
Cartage of ditto, 909½ maunds, from Rajpur to Saharanpur, ...	398	per md. 0	7	0
Railway freight of ditto from Saharanpur to Karachi, ...	1,748	1	0	0
		per ton.		
Shipping charges, 34½ tons, ...	1,185	35	0	0
Total charges, ...	4,723			
Surplus, ...	3,929			

The logs were not less than 3 inches in diameter, or 39 inches in length, and as round, straight in the grain, and free from

knots, as possible ; the bark being unremoved, and all inferior logs were left lying in the forest.

Messrs. Churchill and Sim remarked that "the wood, with the exception of the last consignment, which sold £1 less per ton than the former two lots, was a very good lot ; of good sizes, free from knots, and although nearly all the pieces were split, yet they were mostly straight splits, which are not seriously objected to. Eight inches and upwards in diameter is a good size, and we shall be pleased to receive further consignments."

Box-wood from Jumna Valley.

	Rs.	Rates. Rs. A. P.
Cutting and carriage from forest to Chakrata, 384 pieces, 360 cubic feet, weighing 288 maunds, ...	796	per c. ft. 2 2 0
Carriage from Chakrata to Saharanpur, ...	222	per md. 0 12 0
Ditto Saharanpur to Karachi, ...	553	1 14 0
Shipping charges on 10½ tons, ...	376	per ton. 36 0 0
Total charges, ...	1,947	
Sale proceeds at £19 10*s.* 8*d.* per ton = £196 2*s* 10*d.*, which less discount, sale and dock charges, gives	2,191	
Surplus, ...	244	

It will be seen that the rates for cutting and carriage from the forest are much heavier in the second case, but the wood was carried nine stages by coolies, which accounts for the high rate. The lower rate obtained for the Jumna wood, is due to the fact that, a quantity of second class timber was sent to London, so as to avoid waste ; whilst in the other case, the second class wood was left lying in the forest, only one or at most two lengths of 3 feet being taken from each tree felled.

It appears pretty evident that second class box-wood will not bear the cost of freight to England, and the price paid for it at Saharanpur, on the Scinde, Punjab and Delhi Railway, is only Rs. 2-8 per maund, which is also not enough to repay expenditure, on felling, logging and transport from the Hills.

As there is a fairly large supply of box-wood in the forests of the North-West Himalaya, it is a pity there is no steady local demand for it.

V. Notes, Queries and Extracts.

THE ASIATIC ELEPHANT IN FREEDOM AND CAPTIVITY.

(*Continued from Vol. X., page 582.*)

The elephants usually give some little trouble for the first two nights, but their conservative nature then seems to lead them to believe that there are set bounds to their wanderings; and unless fodder or water becomes scarce, they seldom try to force the guards. A small herd always gives more trouble than a large one. The former may only be a wandering party from some large body of elephants not far away; it then shows a strong desire to break through to join its companions. A small herd, too, probably has no calves with it, which is a great disadvantage, as it is then restless and quick in its movements. And a herd of a dozen elephants or so may be well in command of one courageous leader; whereas, in a large gathering, timid animals preponderate so greatly that a panic is easily established, and elephants that might otherwise behave boldly become infected with the general fear.

One or two of the males of a herd frequently pass in and out of a circle; and I have known several cases in which a portion of a herd has been absent when their companions were surrounded, and has been admitted by the guards by withdrawing at the point where it wished to pass in. Sometimes, but not often, men are killed at their posts by the elephants.

On the day following the investment of the herd, the construction of the kheddah, or small enclosure into which the elephants are to be driven, is commenced. It is situated on one of their chief paths (within the circle), and is constructed with the trunks of young trees, about 6 inches in diameter, and 12 feet high, arranged in a circle of from 20 to 50 yards across. Inside, round the foot of the palisades, a trench 6 feet wide and 4 feet deep is dug, the earth from this being thrown up into a bank on the inner side. The trench and bank of loose earth usually deter elephants from attacking the stockade, or should they do so, prevent their employing their full force against it. The palisades are lashed together with canes, and are strongly supported by cross beams and forked supports behind, the whole structure being designed to support outward pressure only.

Were elephants to pull the palisades inwards, they would yield at once, but they never use their trunks for this purpose. An entrance of 4 yards in width is left for the ingress of the herd, and a gate, studded inside with sharp spikes, is either slung from the trees overhead, or is made in two leaves, and is pushed to upon the entrance of the herd by men stationed behind it.

A stockade of 40 yards in diameter accommodates 100 elephants easily. To guide the elephants into it, two lines of strong palisades are run out from the gate along each side of the path by which the herd is to approach. These guiding wings diverge to perhaps 60 yards across at their commencement, which may be 100 yards or so from the gate. When the whole is completed, the new woodwork is hidden with leaves and branches. The stockade is usually completed in three or four days. The hunters consider Friday the most lucky day for driving, and they make extraordinary efforts to get the stockade ready by that day if possible. The work of the stockade is done by one-half the hunters being taken from the large circle from morning till evening daily, as a weak cordon of guards suffices to keep the elephants in during the day.

All being in readiness for driving, a number of men are taken from the original circle, and a smaller interior surround is formed by commencing at the guiding wings of the kheddah, and posting the men until the elephants are again closed. The original circle is, of course, still maintained, in case of the elephants breaking through the inner one. If the herd be in two or three detachments, as frequently happens, these are quietly driven together, and the whole are then moved forward towards the kheddah. Should they show an inclination to break to the right or left, the men deter them by striking their axes against the trees. When the elephants gain the funnel-shaped approach to the stockade, the men close in from behind, and from the sides, and urge them on with shots and shouts. If the herd suspects danger, and breaks back through the beaters, fatal accidents not uncommonly occur. Sometimes a herd declines altogether to go in the direction of the stockade, owing to their having the wind from that quarter. In such a case a new stockade may have to be constructed, and if that does not succeed, others also. In this way elephants are sometimes kept in a surround for a month.

Supposing the herd to have been got within the wings near the gate, a line of dry grass and bamboos arranged beforehand is fired, and their retreat is cut off. They then sometimes attack the guiding palisades, but men with spears and muskets receive them here. I have seen two cases in which the elephants forced the palisades, and killed men behind them. Tame elephants are used, if possible, to assist at this stage of driving, chiefly as a protection to the men on foot, who run behind them should any elephant turn and charge. There is much less danger of this

occurring in dealing with large herds than with small ones, as should a single elephant charge out of a large herd, it is rarely supported, and it quickly rejoins its companions. But a determined leader of a handful of elephants is liable to be followed at once by the rest. When an elephant chases the men, they betake themselves to the shelter of tree trunks, bamboo clumps, or long grass, and it is astonishing how they frequently escape uninjured. I have known many cases of men standing against a tree, or hiding in tufts of long grass, within a couple of yards of elephants that were pausing in indecision, without being discovered, though the elephants were evidently aware of their close proximity, as they kicked up the ground in anger, and then made off. In such cases the slightest movement would have led to the hunters being instantly trampled to death. Men are frequently killed, of course, but they are almost always young hands who are learning. I saw one such make a narrow escape a few years ago; he ran from an elephant and climbed a tree; the elephant butted the trunk, and the man fell down, but his pursuer was so astonished at the sight that she fled at once.

Sometimes drives are conducted by torchlight, and these seldom fail, owing to the elephant's fear of fire. The scenes on these occasions are exciting beyond description. The elephants in rushing along tear down large branches of trees that are connected with the undergrowth by climbing-plants, and even sometimes upset dry trees bodily in their passage. The cries of the young, and the deep, thunder-like growls of the elders of the herd, the continued crashing of the jungle, and the shots and incessant cries of the men, form, with the unnatural light of the fires and of torches moving through the forest paths, a scene that cannot fade from the memory of anyone who has witnessed it.

When a herd has been driven into the stockade, the gate is closed and barricaded, and men with firebrands and spears repel any attacks upon it or the palisades. But the trench is usually sufficient to deter the elephants from crossing it. On the same or following day, ten or twelve tame elephants are admitted with a mahout and rope-tier upon each, and it is a very remarkable fact that the wild ones very rarely attempt to dislodge the riders, as they easily might. They naturally fail to comprehend anything so foreign to their experience as a man upon an elephant's back. I never knew a case, except one that happened to myself, of any rider being attacked by a wild elephant. The mahouts separate the wild elephants one by one from their companions, when their hind legs are tied by men who slip to the ground for the purpose. A rope is then secured round each captive's neck, and to its hind legs, and it is led out and picketed in the forest near.

If two well matched rival tuskers happen to be impounded in

one stockade, they sometimes fight to death, seemingly regardless of their novel position. If not well matched, the more powerful one bullies the weaker one incessantly. On one occasion, when a herd of forty-eight elephants had been impounded, a scene of this kind occurred, one elephant following and fighting with another almost continuously for two days and nights. The smaller elephant retaliated on others weaker than himself, and between them the pair killed four young elephants and a large *makhna*. They caused such commotion that the tame elephants could not be admitted. At last the larger tusker forced the smaller one across the trench, and against the palisades. The latter commenced to break his way out; and though muskets were fired into his face, and spears and digging tools made red-hot for the occasion, were applied to his trunk and head, the inducement behind was so strong that the counter efforts of the men were unavailing, and he made his way through the palisade, and went off into the jungle. This was at 2 A.M., and was a sufficiently exciting scene. No other elephants attempted to follow, and the gap was quickly repaired.

Amongst these forty-eight elephants was one that had escaped about twelve years ago, judging from the ages of her three calves. We first observed the fact of her being an escaped elephant by seeing old rope marks on her legs. When the tame elephants entered the stockade, two ranged alongside this one, and on being pricked with a spear, and held to kneel, she obeyed at once. She was ridden alone a few days afterwards.

The number of wild elephants that can be taken care of is, at the most, 50 per cent. more than the tame ones. As each capture is concluded, the wild elephants are marched out of the jungle into open country, for if kept in the forest they continue to be excited by jungle sights and sounds, and to struggle for liberty, whilst flies are much more troublesome to their wounds in the jungle than in the plains. Each batch of new elephants requires a number of tame ones to be detached in charge of it; thus the hunting operations are limited by the number of the latter.

When a sufficient number of elephants has been taken, the hunters are dismissed, and all elephants under 7 feet in height are sold to merchants who follow the kheddah parties for the purpose of purchasing such. Those above 7 feet are retained for Government service, except some males and old females which are also disposed of. Not more than 30 per cent. of the elephants captured are young and strong females, thoroughly suitable for Government service. The selected wild elephants are now divided into gangs of twenties, with a proportion of tame ones in charge. These escort the wild ones, bring their fodder, and lead them to water daily. The march from the jungle commences about the end of February, and the elephants reach the depôt at Dacca in May. They are then put

into training, and by November are quite steady, and are drafted for military service.

New elephants are trained as follows :—They are first tied between two trees, and are rubbed down by a number of men with long bamboos, to an accompaniment of the most extravagant eulogies of the animal, sung and shouted at it at the top of their voices. The animal, of course, lashes out furiously at first ; but in a few days it ceases to act on the offensive, or, as native say, "*Shurum lugta hai*," "It becomes ashamed of itself," and it then stands with its trunk curled up, shrinking from the men. Ropes are now tied round its body, and it is mounted at its picket for several days. It is then taken out for exercise, secured between two tame elephants. The ropes still remain round its body to enable the mahout to hold on should the elephant try to shake him off. A man precedes it with a spear to teach it to halt when ordered to do so ; whilst as the tame elephants wheel to the right or left the mahout presses its neck with his knees, and taps it on the head with a small stick, to train it to turn in the required direction. To teach an elephant to kneel, it is taken into water five feet deep when the sun is hot, and upon being pricked on the back with a pointed stick it soon lies down, partly to avoid the pain, partly from inclination for a bath. By taking it into shallow water daily, it is soon taught to kneel even on land.

Elephants are taught to pick up anything from the ground by a rope, with a piece of wood attached, being dangled over their foreheads, near to the ground. The wood strikes against their trunk and forefeet, and to avoid the discomfort the elephant soon takes it in his trunk, and carries it. It eventually learns to do this without a rope being attached to the object.

I have only time to add a few facts regarding the financial results of elephant catching by the Government establishment at Dacca. Referring only to the official year ended 31st March, 1883, the expenditure upon the hunting establishment for twelve months was *£12,948, and the receipts by surplus elephants sold, and the value of those retained, £19,492, showing a profit of £6,544. Of this amount, £4,000 was surplus from the preceding year.

During the past five years the annual average number of elephants captured during our short working season, from December to February, has been 154. The greatest number in any single year was 252 in seven weeks in 1882, and 199 in a similar period in 1883. A ready sale is effected amongst the native landowners, and others who are fond of keeping elephants, of all those not required by Government.

The belief that wild elephants have decreased in India is not an uncommon one, and may have arisen from the fact of laws

* Taking the Rupee at 2*s.* for convenience.

having been passed in late years for their protection. Also, from their undoubted decrease some years ago in Ceylon. But the case of that island is not analogous to that of the continent. In Ceylon, elephants have always been made a peculiar object of pursuit by large numbers of sportsmen, and by paid native hunters, whilst their range is not without its limits. To show the numbers that have been destroyed there, I may quote the official statistics between 1845 and 1859, which show that during those fifteen years rewards were paid for 5,194 elephants killed in, I believe, only a part of the island. Similar destruction has gone on for years, until rewards were abolished some years ago. But elephants are again becoming numerous, and are again allowed to be shot.

But on the Continent of India the number shot by European sportsmen has always been small, and it was only for a few years that natives were induced to turn their attention to killing them by a reward given for their destruction in the Madras Presidency. This was soon withdrawn, and the representations of humane officials having further led to the curtailment of the wasteful methods of trapping them practised by native hunters, the wild elephant now enjoys perfect immunity throughout the Western Ghâts, and those boundless forests extending for hundreds of miles along the foot of the Himalayas into Burmah and Siam. The number annually caught by the Government hunting establishment at Dacca (the only one at present in India), and by licensed native hunters, is, comparatively speaking, very small; and there is no doubt that all the forest ground that can be legitimately allowed to the wild elephant is as fully occupied at present as is desirable. The elephant-catching records of the past fifty years attest the fact that there is no diminution in the numbers now obtained in Bengal, whilst in Southern India elephants have become so numerous of late years that they are annually appearing in places where they had never been heard of before.

In the Billigarungun Hills, an isolated range of 300 square miles on the borders of Mysore, wild elephants first made their appearance about the beginning of this century, having strayed from the forests at the foot of the Neilgherry range, across an intervening strip of some thirty miles of civilised country. Prior to that time the Sholagas, a wild tribe that inhabit the Billigarungun hills, but which has now dwindled down to a handful of savages, were a numerous people; traces of their former extensive cultivation, even of orange groves, gardens, and iron-smelting furnaces, still exist, together with lakes on the summit of the hills, for the convenience of the cattle which used to be driven thither from the neighbouring low country for pasturage during the hot weather. The Sholagas were almost destroyed by three successive visitations of small-pox, a disease which is always exceedingly fatal amongst hill people in India;

their lands relapsed into the densest forest; and wild elephants and bison now abound where probably not one was to be found a century ago. The case of these hills is an interesting instance of a large tract of country in India having relapsed into a wilderness in recent times.

To give an idea of the numbers of wild elephants in some forests, I may say that during the past five years, between 1878 and 1883, 1,066 wild elephants have been captured by the Dacca hunting establishment in a tract of country about fifty miles long by twenty miles broad, in the Garo-hills in Assam, whilst fully as many more were met with during the hunting operations. Of course these elephants do not confine themselves to that tract alone, but wander into other parts of the hills. There are immense tracts of forest in India similarly well-stocked with wild elephants.

I am sure it will be regarded as a matter for hearty congratulation by all, that so grand, interesting, useful, and harmless an animal as is the elephant is in no danger of becoming extinct in India. Though small portions of its haunts have been cleared for tea or coffee cultivation, the present forest area of the country will, probably, never be practically reduced, for reasons connected with the timber supply and climate; and as long as its haunts remain, the elephant must flourish under due regulations for its protection.

(*To be continued*).

EARLY HISTORY OF FORESTRY.—Forestry as a science is of a comparatively modern date. In primeval times, the surface of the globe was covered with dense forests, and the clearing of them was the first occupation of the human race. Take, for instance, India; the production of her jungles found their way into the commerce of antiquity long before she was ever known by name. The spices used throughout Egypt, Syria, and the adjacent countries, must have been supplied from here. Recent explorations in the ruins of Nineveh and Babylon have shown that the wood employed in the building of the temples was Indian teak. With the descent of the Aryans into the plains of Central and South-East Asia, they were as a matter of course deforested, but there still remained large patches of the country covered with dense vegetation which the Aryan conquerers could not penetrate. It was the same in Europe. The annals of Tacitus give us an insight into the nature of the land where thousands of the Roman soldiery found their graves in the impenetrable mountain fastnesses of Germany, and the mournful exclamation of the Emperor Augutus, which was ever on his lips, whether awake or asleep, "Varus, restore to me my legions," can help us in forming an idea of the masses of vegetation which covered Europe, and ingulphed the flower of Roman chivalry. An indiscriminate clearance of these obstructions,

with the advance of civilization, was an actual necessity in those days, but with the gradual destruction of forests, came the necessity of preserving such portions of them as would contribute to the well-being of society. The rules and regulations relating to forestry may be traced back to the dark ages of European history ; but forestry conducted on scientific principles was unknown on the Continent till the middle of the 17th century, and the first glimpse we get at the forest economy of France is in 1660, before the issuing of the famous Code of 1669. The following account given by a Spanish writer, which he had prepared in accordance with orders received from the higher authorities of the State, will be found very interesting :—

"In the seventeenth century originated in some of the States of Germany the application of technical science to the treatment of forest masses. The rules, the aphorisms, and the whole of the directions which are comprised in the forestal knowledge of the ancients, are principles indefinite, obscure, uncertain, unconnected, destitute of method or systematized relations. Moser created in 1757 the first body of systematic teaching on the subject ; and to the impulse given to this by him, and the weighty energy of Langen, Laspar, Zanthier, and others, are we indebted for the formation of the first plans of scientific treatment of forests begun in 1731 in the forests of the Dukedom of Brunswick. He, in his time, Langen being the first to do so, perceiving the necessity of entrusting the management of the forests to a specially educated and trained body of officials, possessing all necessary knowledge and information, with a view to raising up a body of such men, established the first school of forestry in Wernigerode in the year 1772. But others consider the first School that founded by Zanthier in Ilsenberg, which was followed some years later by the establishment of that by Haase in Lauterberg, that which G. Hartig founded in Hungen in 1791, that in Zillbach by H. Cotta in 1795, and various others, all due to the efforts of individuals, and manifesting that essentially practical character, which was so requisite to meet the requirements of the time and the conditions in which the distinguished founders were placed, but devoid of means which would allow of there being given to them the influence and development which became needful.

"Contemporaneously with the schools there were produced also methods, or systems, of exploitation ; and the names which have been cited are those of men who proved authorities of the highest rank, who have opened up new paths in forest study. For me it is impossible, nor does space permit, to produce a chronological and critical narrative of the principal phases through which the newborn forest science passed in its evolution and successive development ; fresh in the memory of many in Spain must be the remarkable articles written under the title, 'Sistemas Forestales,' of the erudite forest engineer, his Excellency Snr. D. Agustin Pascual, the first Spanish writer on *Dasenomy*, and formerly professor in our School of Forestry, to whom it is enough that I thus refer, while passing on to state succinctly the new form, the multiplication and general organisation of forestal schools which occurred in Germany, and in some other countries in Europe.

"The primary organisation of the schools founded in Ilsenberg, Wernigerode, Lauterberg, Hungen, Zillbach, Walterhausen, Rottenhaus, Castell, &c., in the period from 1766 to 1805, was that of several other private centres of instruction, which died out with their founders, or suffered the fate which befell these in the course of their existence. All these made themselves remarkable by the great impulse and development which they gave to the diffusion of forest science, and by their having roused up a numerous and distinguished body of men to assist, and direct at a later time the work of bringing into order the forests of the districts in which they were situated. There stands out prominently amongst all these the school founded by Cotta. He, being charged with the reduction to an orderly condition of the forest of Fishbach, spent some years in the execution of this work, and during these years giving theoretic and practical instruction to the young men who assisted him there: thus was instituted the new centre of forestal instruction of Zillbach. Such reputation was acquired by this establishment of modern times, that in 1795 there was granted to it a subvention from the State, thanks to which he was able considerably to augment the means available then for the prosecution of study. In 1810, Cotta was appointed Director of Forest Management in Saxony. He at once perceived and pointed out the lack which existed of a skilled staff of officials who should execute and assist in the execution of his projects, and with a view to meeting this desideratum the promoted school of Zillbach was transferred to Tharand in 1811, and ceded to the Government on the 12th of May, 1816. Converted into a Government academy and furnished with all necessary resources, the School of Tharand, devoted to the instruction of the forest engineers of the State, very soon flourished beneficently, attracting to study there the studious youth of many different countries; and serving as the sharp edge of a wedge for the general diffusion of those truths which, spreading themselves a little later in different countries, proved the occasion of there being opened other schools which take pride in calling themselves daughters of the Saxon Academy.

"In their turn, in Austria and Russia—nations which, if they did not take the first step, followed at once the advancing march of the States of Germany—there had been organised schools of forestry: those in Austria having the character of a private establishment in the beginning, and those of Russia being Government institutions from the first. Amongst these, the first established—that founded in 1770 by Ehrenwerk in Rotherhaus, in Bohemia—continued till 1791. This was succeeded by another, established in the beginning of the present century in Kruman; and coincident with its appearance we meet with the schools of Eisgneb in Moravia, Eisenstadt in Hungary, and Gratzen in Bohemia.

"Passing from private seminaries to public and Government institutions, there were founded the Schools of Datschetz in Moravia, and that of Plass in Bohemia, opened in 1823 and 1880, in which there is some Government intervention, but it is very limited. When the Government was once convinced—as was the case likewise with the Government of Germany—of the urgent necessity there was for entrusting the administration of forests to a staff of officials endowed with special scientific knowledge, they arranged in 1805 the opening

of a course of practical instruction in sylviculture in Purkersdorf, near Vienna; and subsequently, in 1813, increasing the staff of professors, and with a well-considered plan of instruction this school was transferred to Mariabrunn, not far from the capital of the empire. In 1827 the plan of study was changed, and the subjects of study were divided into four *semestres*, or half-year sessions; ultimately, in 1852, this was reorganised by distributing over three years the study of the different prescribed subjects which comprised the course followed by forest engineers."—*Indian Agriculturist.*

PLANT CELLS.—From an early period in the history of Vegetable Anatomy—from the time that Grew and Malpighi demonstrated the varied internal cellular construction of plants—experiments to demonstrate the use of these varied structures have been made. And now, when this department of botany has taken a sudden bound onwards, and chemical re-agents have come to the help of the microscope, it may be hoped that substantial progress may be made in this direction. The structure of plants, like their outward conformation, is partly an hereditary endowment from generation to generation, partly the result of progressive adaptation to certain conditions. So long as the power of adaptation or accommodation to circumstances remains, so long is there room and opportunity for variation as occasion may demand. On the other hand, it is conceivable that plants which have for a long series of ages become adapted or accustomed to one uniform set of conditions remain unaffected, do not vary when those conditions are altered, or, being unable to accommodate themselves to new circumstances, die out. On some such principles, probably, depends the fact that the gardener can grow certain plants without difficulty, while others defy all his efforts. But to descend from the region of speculation to that of practice, we may point out that the internal conformation of plants sometimes offers as good hints to the cultivator as to the conditions under which certain plants may be expected to thrive as the more easily observed external appearances do.

By way of illustration we may mention the presence in the leaves of certain plants of what are termed palissade-cells. These are oblong cells, arranged vertically, that is, at right angles to the surface of the leaf. Their form and direction may be indicated thus ||||||, the ordinary leaf-cells being more or less globular or branching, or, if elongated, then elongated horizontally in a direction parallel to the surfaces of the leaf. The term "palissade-cells," then, very well expresses the form and arrangement of a certain class of cells packed closely together, like the wooden rails of a park fencing. A very low power of the microscope is sufficient to allow these cells to be seen, and in some cases an ordinary pocket lens, if of tolerably high magnifying power, is sufficient to enable them to be seen. These

palissade-cells are usually filled with "leaf-green," or chlorophyll.

We cannot here pursue the subject from the point of view of the anatomist or physiologist, it must suffice to point out the practical deductions which are insisted on by Stahl, Vesque, and other students of this particular structure. When a gardener, says M. Vesque, in substance, receives a new plant of imperfect or unknown history, he does not pay much heed to systems of classification, as a botanist would do, for they afford him little help. He judges by the external appearances of the plant what is likely to be the appropriate treatment, and so, for instance, he submits to the same general conditions Stapelias and Aloes, Agaves and Mesembryanthemums, and so forth—plants, in fact, whose "habits" and requirements are the same, whose adaptive characters, that is, are identical, although their more purely hereditary peculiarities are widely different. In the case of succulent plants, such as those just mentioned, the matter is easily determined; but in those cases where the exterior appearance gives no indication of the habit and requirements of the plant, then a microscopic examination must be made, and this will enable the observer to say with something like certainty whether the plant naturally grows in the sun or the shade—whether its internal structure is such as to allow of free or of relatively little transpiration—whether it is likely to demand frequent and copious waterings, or whether it is capable of living long without any. We may give a few illustrations. If the palissade-cells are abundant and well marked, the probability is that the plant requires a proportionate amount of exposure to light; if, on the other hand, the palissades are scanty or not present, the inference is that the plant requires to be grown in the shade. Between these two extremes is a group of plants of variable and inconstant nature: such plants obviously are enabled by Nature to adapt themselves more or less successfully to different conditions.

In the case of moisture, the subject may be divided into the discussion of the arrangements for, in the first place, the supply of water; and, secondly, for its retention and storage. Indications as to the supply, great or little, may be gathered from the thickness of the cuticle, and the number and position of the pores or stomata.

As to the faculty of storage, that may be judged of from the nature of the epiderm or skin beneath the cuticle, the abundance of cellular tissue—that is, the succulence of the leaf, and other characters. The first set of characters supply hints as to the absolute quantity of water required; for instance, the thinness of cuticle and abundance of stomata would naturally suggest frequent and copious waterings; the second set of characters suggests the abundance and frequency of water, whether little and often, or a large quantity less often. Plants

whose thick rinds indicate a relatively little amount of transpiration naturally require a hotter temperature and a fuller exposure to light than others.

A plant with small pores or stomata transpires less than one with large or with numerous pores. Hairs on the surface check transpiration, spongy construction of the leaf is also an indication of relatively little transpiration. Obviously, the more fleshy the plant the less need there is for watering frequently.

Hard woody cells, such as those which constitute the grit of a Pear, and which serve as a sort of skeleton to support the tissues, are taken by M. Vesque to indicate that the plant is exposed to bright sunlight and occasional drought, as Proteas, &c., or to occasional excessive losses of water, and indicate the necessity for copious watering at intervals, as in the case of succulent plants.

Pursuing his subject M. Vesque goes on to show how the epidermal cells, or those sub-adjacent to them, in some cases act as reservoirs for water ; and how in the tissues of some leaves may be found other structures having a similar office, so that the thick rind, the deficiency of stomata, the dense hairs with which plants growing in dry places are provided, indicate the quantity of water which traverses the plant, while the reservoirs for water furnish indications as to the frequency of watering and the length of interval between the operations.

The intelligent observer, adds M. Vesque, will know how to avail himself of the indications presented to him, which will be varied and combined in a thousand different ways, but from which he will be enabled with accuracy and judgment to regulate the delicate operation of watering.

We have no doubt whatever that M. Vesque is on the right track, but we fear it will be long before our young gardeners will avail themselves of the help of the microscope rather than of the rough-and-ready measures that they are accustomed to practise. In any case it will be admitted that there are few operations in practical gardening which are carried out with less intelligent judgment than is watering, and any means which may serve to obviate this will be a boon to head gardeners.

Lastly, we may mention that we have put M. Vesque's notions to a partial test with reference to the leaves of Orchids, which present remarkably great variations of structure, and in some cases of great interest. We have examined one or two dozen species, with the general result of confirming M. Vesque's notions, or, at least, of satisfying ourselves that "there is something in them." On another occasion we may speak more fully on this point.—*Gardener's Chronicle.*

ABIES WEBBIANA.—Few, if any, of our conifers are more handsome than this denizen of the Himalayas. The bold overlapping, densely crowded foliage of a silvery white on the under-surface,

and the noble dark purple cones, indeed, render it a most striking species. The botanical history is well known, and the tree is adequately described in the text books. It is only necessary for us, therefore, to allude to one or two points of structure, such as the leaves, which diverge on each side from the branch, leaving a wide furrow or parting between them on the upper surface. The buds are sub-globose, pale cinnamon-brown, and covered with resin. As to the leaf structure some discrepancy exists between the accounts given by Bertrand and McNab ; the former says the structure is the same as that of *A. Pindrow*, which he further states has a disconnected scanty layer of strengthening fibres (hypoderm) beneath the epidermis ; MacNab, however, describes the hypoderm as continuous, and so we also find it. The outline of the leaf-section is different in the two forms ; in *Webbiana*, the margins are pointed and recurved, while in *Pindrow*, they are blunt, rounded, and but little recurved. These little details are important, because while in the opinion of some, *Webbiana* and *Pindrow* are distinct species, in that of others, they are only two forms of one and the same. Certainly in English gardens, the two look different, and the question whether they belong to one species or not, is one which will be answered by each observer according to his proclivities. Brandis, in his "Forest Flora of North-Western and Central India," leans to the view that the two forms are varieties of one species ranging from Afghanistan on the west, to Bhutan and Sikkim on the east.

The form called *Webbiana* occurs on rocky ridges at higher elevations, and is a smaller tree with shorter, less bifarious leaves, and usually thicker and shorter cones. Var. *Pindrow* occurs on better soil in sheltered places, and is a large tree with longer and narrower leaves and generally cylindric cones. *A. Webbiana* occurs in various parts of the Himalaya, at elevations of from 8,000 feet to 13,000 feet, forming extensive forests mixed with maples and birches, and often associated with *Abies Smithiana* and *Pinus excelsa*. In Sikkim it occurs with yews, oaks, rhododendrons, and bamboos. It thrives best in cold, damp glens. From the dark colour of the adult foliage it gives the name of "black forests" to several mountain forests of the north-west Himalaya. In this country it is "spring tender," owing to the early period at which it starts into growth. In its native country it attains a height of 120 feet to 150 feet, and a girth of 9 feet to 15 feet. The tree forms a tall cylindrical crown, like that of a Lombardy poplar. The bark of the young trees is silvery-grey, becoming darker as it advances in age. The wood is whitish, inodorous, soft, useful for indoor constructions, but not suitable for use where exposed to the weather.

On the Jhelum, according to Brandis, the leaves are used as fodder, and are stored for winter use. Wallich, who orginally described the tree, speaks of a violet dye being yielded by

the cones in Nepal. Captain Webb, after whom the species was named by Wallich, first met with the plant in Nepal, and in Lambert's "Genus Pinus" occurs the following passage from his pen, as to its beauty :—"The silvery hue of its bark, the beautiful contrast of the leaves with the rich purple of the cone glittering with globules of transparent resin, produce, in combination, one of the most striking objects that can well be imagined."

Major Madden, in his valuable paper on Himalayan Conifers, reprinted in Vol. V. of the "Journal of the Horticultural Society, London, 1850," says that *Pindrow* grows at lower elevations than *Webbiana;* and also that in habitat, and several marked peculiarities and constant differences between the two forms, which the natives attribute to climatal causes : "This persuasion of the force of circumstances in the transmutation of species is by no means uncommon in the Himalaya." Hooker mentions *Webbiana* as the most abundant pine in Sikkim. Veitch "Manual of Coniferæ" considers *A. Pindrow* to be distinct from *Webbiana,* and more tender in cultivation. As to *Webbiana,* he recommends that young plants should be protected by a slight covering during frosty weather, so small an amount of trouble being well worth taking to preserve so beautiful a tree. As the tree gets older it ceases to need even this precaution.—*Gardeners' Chronicle.*

It was only the other day we had occasion to remark that the teak wood imported into Madras from British Burmah was not only deficient in quantity, as compared with that supplied to Calcutta and Bombay, but was also inferior in quality, and that the supply from the local Forest Department was insufficient to meet the requirements of the service. We now see that the matter has attracted attention in that Presidency. On the 20th of October last, Captain W. L. C. Baddeley, R.E., General Superintendent, Public Works Stores, wrote to the Superintending Engineer, V. Circle, as follows :—"With reference to the G. O. of 15th March, 1884, on the subject of laying in a stock of teak for the use of the Public Works Department, I have the honor to forward copy of a letter received from the officiating Conservator of Forests, Pegu Circle. The Madras Forest Department are unable to supply the teak required, *vide* copy of letter from the Collector of Coimbatore. The price of teak is very high in the Madras market, and I think it is most desirable that a large stock should be laid in to ensure the supply to the Public Works Department of good sound timber at a moderate price. The attempt to obtain *jarah* wood from

Note —We hold the opinion that the *A. Webbiana* is merely a dwarfed variety due to the inclement climate in which it grows. It is found near the limit of vegetation, associated with birch and white rhododendron.—[ED.]

Australia has failed ; and even if it had been successful, I consider that the difficulty of working it would have been a great bar to its use ; for similar reasons, I do not think that *karrai* timber could be economically used for the ordinary work of the Public Works Department, even if it could be delivered in Madras in large sizes at Rs. 100 per ton. I am making arrangements for a small supply of *sál* from Ganjam, but the cost of transit will, I fear, make the price prohibitory, and I am also doubtful about the size. As regards quality, I am convinced that, for the ordinary work of the Public Works Department, no wood is equal to teak ; and I therefore think that it will be found economical and satisfactory to accept the offer of the Conservator of Forests, Pegu. The selection and measurement of the wood might be safely left to the Forest Department. Their offer refers to good sound teak from 25 to 30 feet long and 6 feet girth, which is exactly the class of logs required ; but if it is considered necessary, the Executive Engineer, Rangoon, might be asked to pass the timber before shipment." *Enclosure.*—From H. C. Hill, Esq., officiating Conservator of Forests, Pegu Circle, to the General Superintendent, Public Works Stores, Madras, dated Rangoon, 6th October :—" In reply to your No. 760, dated 13th September, 1884, I have the honor of informing you that I can supply you in November with 400 or 500 tons of good sound teak logs, 6 feet in girth and from 25 to 30 feet long, at Rs. 95 per ton of 50 cubic feet, delivered ex steamer at Madras. 2. I should require you to arrange for the selection and measurement of the logs at the depôt in Rangoon." —*Indian Agriculturist.*

M. HANSEN-BLANGSTED contributes to *L'Exploration* an interesting article on the struggle between trees in the Danish forests. The chief combatants are the beech and the birch, the former being everywhere successful in its invasions. The paper refers especially to the district of Silkeborg in the heart of Jutland. Forests composed wholly of birch are now only found in sterile sandy tracts ; everywhere else the trees are mixed, and wherever the soil is favourable the beech rapidly drives out the birch. The latter loses its branches at the touch of the beech, and devotes all its strength to its upper part, where it towers above the beech. It may live long in this way, but it succumbs ultimately in the fight—of old age if of nothing else, for the life of the birch in Denmark is shorter than that of the beech. The writer believes that light is the cause of the superiority of the latter, for it has a greater development of its branches than the birch, which is more open, and thus allows the rays of the sun to pass through to the soil below, while the tufted, bushy top of the beech retains them, and thus preserves a deep shade at its base. Hardly any young plants can grow under the beech except its own shoots ; and while the beech can

flourish under the shade of the birch, the latter dies immediately under the beech. The birch has only been saved from total extermination by the facts that it had possession of the Danish forests long before the beech ever reached that country, and that certain districts are unfavourable to the growth of the latter. But wherever the soil has been enriched by the decomposition of the leaves of the birch the battle begins. The birch still flourishes on the borders of lakes and other marshy places, where its enemy cannot exist. In the same way in the forests of Zeeland the fir forests are disappearing before the beech. Left to themselves the firs are soon replaced by the beech. The struggle between the latter and the oak is longer and more stubborn, for the branches and foliage of the oak are thicker, and offer much resistance to the passage of light. The oak also has great longevity, but sooner or later it, too, succumbs, because it cannot develop in the shadow of the beech. The earliest forests of Denmark were mainly composed of aspens, with which the birch was apparently associated ; gradually the soil was raised and the climate grew milder ; then the fir grew and formed large forests. This tree ruled for centuries, and then ceded the first place to the holm oak, which is now giving way to the beech. Aspen, birch, fir, oak, and beech appear to be the steps in the struggle for the survival of the fittest among the forest trees of Denmark.—*Nature.*

THE following extracts are from the resolution of the Chief Commissioner of Burmah on the Land Revenue administration for 1883-4 :—

Fodder Reserves and Arboriculture.—There is one fodder reserve near Rangoon, which was taken up and is kept for the use of the Commissariat Department. For the pasturage of village cattle, grazing-grounds are being set apart in all districts to which the survey and settlement has extended. The business of demarcating these grazing-grounds is not completed in any district, and the selection of grazing-grounds is still going on. Next year complete figures will be furnished of the grazing-grounds selected and of those demarcated up to date. In the unsettled districts, the grazing-ground question has been less systematically pursued ; but there the available grazing in unreserved forests and savannahs is extensive, and therefore the matter is less pressing. In the small forest reserves, which abut on, or are in the middle of rice plains, grazing is allowed to neighbouring villages on easy terms.

Surveys.—Three Cadastral Survey parties and one Topographical Survey party were at work in the province during the year. The Topographical party were engaged in mapping the forest reserves, in order to facilitate the preparation of proper Working Plans of the State Reserved forests. The work of this party, which cost Rs. 393 per square mile for a total outturn of 263 square miles, has been noticed in the annual forest report, and requires no further mention here.

In the settled districts, large areas of hilly country, of woodland, of swamp, of savannah, and of tidal forest, have been or will be omitted from the cadastral survey. They will hereafter, have to be mapped by some less costly method of survey in order to complete the geographical material of the province.

THE VALUE OF AMERICAN FORESTS.—The magnitude of the forestry products of the United States is shown by recent statistics. These demonstrate that notwithstanding the enormous value of the corn crop, it is slightly exceeded by the annual value of the forest products. The following remarkable figures show the value of the principal products of the country in their regular order for the year 1883 :—Forestry, $700,000,000 ; corn, $679,714,499 ; wheat, $474,291,850 ; hay, $371,811,084 ; cotton, $280,266,242 ; oats, $150,243,565 ; gold and silver, $74,400,000 ; coal, anthracite and bituminous, $64,500,000 ; iron ore, $20,470,000 ; and total other mineral products, $218,385,452. By far the largest portion of the forestry products is used as lumber. As lumber it is used for building material, fencing, and innumerable manufactures ; and it also enters into the industries of the people in many forms. It appeared by the last census that the value of the wood used annually in cooperage was $33,714,770. Several million dollars' worth are annually consumed in the manufacture of baskets. The chief of the forestry division of the Agricultural Bureau states that 2,999,542 cords of bark were used in tanning in 1880, at an average cost of $6 per cord, which would bring the aggregate value of bark up to $17,456,252. This does not include the value of trees cut for bark and left to decay. The lucifer matches consumed in the United States require wood to the value annually of $3,298,562.—*Times*.

WE understand that Mr. Lowrie has found indigenous teak growing in the Marwar Aravalli Hills, at 73° 18′ West and 24° 42′ North.

V. Extracts from Official Gazettes.

1.—Gazette of India—

Nil.

2.—Calcutta Gazette—

The 1st December, 1884.—*Babú Shama Churn Chuckerbutty*, Forest Ranger, is appointed to officiate as a Sub-Assistant Conservator of Forests in Bengal, and is posted to the Kurseong Forest Division with effect from the 15th June, 1884.

Mr. J. C. Mendes, Forest Ranger, is appointed to officiate as a Sub-Assistant Conservator of Forests in Bengal, and is posted to the Darjeeling Forest Division, with effect from the 15th June, 1884.

Babú Shama Churn Chuckerbutty, Officiating Sub-Assistant Conservator of Forests, is posted to the charge of the Angul sub-division of the Orissa Forest Division, on being relieved of his present duties in the Kurseong Forest Division.

The 9th December, 1884.—The following promotions are made with effect from 25th September, 1884, in the vacancy caused by the absence of *Mr. D. E. Hutchins*, Deputy Conservator of Forests, 3rd grade, on deputation at Cape Colony, after the expiration of the furlough granted to him with effect from 7th March, 1883 :—

Mr. E. G. Chester, Deputy Conservator of Forests, 4th grade, and officiating in the 3rd grade, to the 3rd grade of Deputy Conservators *sub. pro tem.*

Mr. W. M. Green, Assistant Conservator of Forests, 1st grade, and officiating Deputy Conservator of Forests, 3rd grade, to the 4th grade of Deputy Conservators, *sub. pro tem. Mr. Green* will continue to officiate in the 3rd grade of Deputy Conservators until further orders.

Mr. C. A. G. Lillingston, Assistant Conservator of Forests, 2nd grade, and Officiating Deputy Conservator of Forests, 4th grade, to the 1st grade of Assistant Conservators *sub. pro tem. Mr. Lillingston* will continue to officiate in the 4th grade of Deputy Conservators until further orders.

The 16th December, 1884.—*Mr. E. Fuchs*, Assistant Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extension of furlough for four months.

3.—North-West Provinces and Oudh Gazette—

No. $\frac{3741}{11\text{-}448\text{-}4}$.—*The 17th December, 1884.*—*Mr. W. R. Fisher*,

Officiating Conservator of Forests, School Circle, and Officiating Director of the Forest School, Dehra Dún, privilege leave for two months and fifteen days, with effect from the 15th December, 1884, or subsequent date.

No. $\frac{3743}{\text{II-448-4}}$ —*Mr. E. McA. Moir*, Deputy Conservator of Forests in charge of Jaunsar Division, to officiate as Conservator of Forests, School Circle, during the absence on privilege leave of *Mr. W. R. Fisher*, or until further orders.

No. $\frac{3746}{\text{II-448-4}}$ —*Mr. E. E. Fernandez*, Officiating Deputy Director of the Forest School, to officiate as Director of the Forest School during the absence on privilege leave of *Mr. W. R. Fisher*, or until further orders.

No. $\frac{3779}{\text{II-445-7}}$ —*Mr. C. Bagshawe*, Deputy Conservator of Forests in charge of the Garhwál Division, is placed temporarily on special duty from the 1st January, 1885, to assist the Conservator of Forests, Central Circle, in the Khedda operations.

No. $\frac{3783}{\text{II-445-7}}$ —*Mr. F. B. Bryant*, Assistant Conservator of Forests (on special duty), to the charge of the Garhwál Division during the absence on deputation of *Mr. C. Bagshawe*, or until further orders.

4.—PUNJAB GAZETTE—

No. 534.—*The 10th December, 1884.*—*Mr. J. L. Pigot*, Assistant Conservator of Forests, 3rd grade, is promoted to Assistant Conservator, 2nd grade, with effect from the 25th of October, 1884.

5.—CENTRAL PROVINCES GAZETTE—

No. 5844.—*Mr. Mahomed Ghouse*, Sub-Assistant Conservator of Forests, temporarily attached to the Jubbulpore Forest Division, is posted to the Balaghat district.

Mr. Mahomed Ghouse, relinquished charge of his duties in the Jubbulpore Division on the forenoon of the 19th, and reported his arrival at Balaghat on the afternoon of the 29th ultimo.

6.—BRITISH BURMAH GAZETTE—

Nil.

7.—ASSAM GAZETTE—

No. 440.—*The 28th November, 1884.*—*Mr. D. P. Copeland*, Assistant Conservator of Forests, Gáro Hills Division, returned from privilege leave on the afternoon of the 11th November, 1884.

8.—MYSORE GAZETTE—

Nil.

9.—MADRAS GAZETTE—

The 18th November, 1884.—*P. Srinivasa Row*, appointed Probationary Forest Ranger in Office order No. 43 of 1884-85, is posted to the Badvél Range, Cuddapah District.

The 28th November, 1884.—*Abdul Rhyman*, Forester, 2nd grade, who has returned from the Forest School, Dehra Dún, after obtaining a Forester's certificate, is appointed to act as Ranger, 5th grade (on probation), and posted to the North Arcot District.

Mr. H. O'Neill, Ranger, 3rd grade, Madura District, is detailed for special duty in the same district in connection with the demarcation and survey of Lower Palnis.

S. Therunáráyana Aiyangár, Ranger, 5th grade (on probation and supernumerary), Tinnevelly District, is transferred to the Madura District.

M. Jambunátha Sástri, Forester, 1st grade, Chingleput District, is appointed to act as Ranger, 5th grade, Madura District.

10.—BOMBAY GAZETTE—

Nil.